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### STUDIES IN THE GENUS COCCOLOBA, IV. THE SPECIES FROM PUERTO RICO AND THE VIRGIN ISLANDS AND FROM THE BAHAMA ISLANDS

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NATHANIEL BRITTON and his colleagues have published treatments for the species of *Coccoloba* known from Puerto Rico and the Virgin Islands and from the Bahama Islands as parts of larger floristic works. Since both of these floras are in use today, it is desirable to present two treatments to parallel Britton's work and to bring up to date the nomenclature as well as the species definition. Since Britton's work on these island areas appeared, there have been relatively few additional collections from these areas and the need for more material of many species remains critical. A field knowledge of the species over the larger area of the West Indies has brought about a better understanding of the morphological variation represented in the areas considered in this paper. As a result, several of Britton's species have been reduced to synonymy and others have been assigned to older taxa not fully understood at the time of Britton's publication.

The species of *Coccoloba* in Puerto Rico, the Virgin Islands and the Bahamas as recognized by Britton and his colleagues are listed below with their equivalents in the present study:

|                                 |       |                                               |
|---------------------------------|-------|-----------------------------------------------|
| <i>Coccolobis bahamensis</i>    | ..... | <i>Coccoloba tenuifolia</i>                   |
| <i>Coccolobis borinquensis</i>  | ..... | <i>Coccoloba swartzii</i> f. <i>urbaniana</i> |
| <i>Coccolobis diversifolia</i>  | ..... | <i>Coccoloba swartzii</i>                     |
| <i>Coccolobis grandifolia</i>   | ..... | <i>Coccoloba pubescens</i>                    |
| <i>Coccolobis klotzschiana</i>  | ..... | <i>Coccoloba microstachya</i>                 |
| <i>Coccolobis krugii</i>        | ..... | <i>Coccoloba krugii</i>                       |
| <i>Coccolobis laurifolia</i>    | ..... | <i>Coccoloba diversifolia</i>                 |
| <i>Coccolobis northropiae</i>   | ..... | <i>Coccoloba northropiae</i>                  |
| <i>Coccolobis obtusifolia</i>   | ..... | <i>Coccoloba microstachya</i>                 |
| <i>Coccolobis pirifolia</i>     | ..... | <i>Coccoloba pyrifolia</i>                    |
| <i>Coccolobis rugosa</i>        | ..... | <i>Coccoloba rugosa</i>                       |
| <i>Coccolobis rupicola</i>      | ..... | <i>Coccoloba costata</i>                      |
| <i>Coccolobis sintenisii</i>    | ..... | <i>Coccoloba sintenisii</i>                   |
| <i>Coccolobis swartzii</i> var. |       |                                               |
| <i>portoricensis</i>            | ..... | <i>Coccoloba swartzii</i>                     |



|                                 |                          |
|---------------------------------|--------------------------|
| <i>Coccolobis uvifera</i> ..... | <i>Coccoloba uvifera</i> |
| <i>Coccolobis venosa</i> .....  | <i>Coccoloba venosa</i>  |

In two earlier works Baron H. F. A. Eggers published studies of the flora of St. Croix (St. Croix's Flora, 110. 1876, The Flora of St. Croix and the Virgin Islands, Bull. U.S. Nat. Museum 13: 88. 1879). I do not always agree with the species to which Britton and Wilson have assigned Eggers' species and varieties. I have seen a large number of Eggers' specimens through the courtesy of the Director of the Botanical Museum and Herbarium at Copenhagen. While Eggers cited few collection numbers in the two publications mentioned above, his annotations of specimens and the localities given can be taken to indicate the specimens he had for study. The species and varieties which Eggers cites should be referred as follows:

|                                     |                                                    |
|-------------------------------------|----------------------------------------------------|
| <i>Coccoloba diversifolia</i> ..... | <i>Coccoloba krugii</i> $\times$ <i>C. uvifera</i> |
| <i>Coccoloba laurifolia</i> .....   | <i>Coccoloba diversifolia</i>                      |
| <i>Coccoloba leoganensis</i> .....  | <i>Coccoloba diversifolia</i>                      |
| <i>Coccoloba nivea</i> .....        | <i>Coccoloba venosa</i>                            |
| <i>Coccoloba obtusifolia</i>        |                                                    |
| var. <i>jacquinii</i> .....         | <i>Coccoloba microstachya</i>                      |
| var. <i>barbadensis</i> .....       | <i>Coccoloba swartzii</i>                          |
| var. <i>parvifolia</i> .....        | <i>Coccoloba microstachya</i>                      |
| <i>Coccoloba punctata</i>           |                                                    |
| var. <i>jacquinii</i> .....         | <i>Coccoloba swartzii</i>                          |
| var. <i>barbadensis</i> .....       | <i>Coccoloba krugii</i> $\times$ <i>C. uvifera</i> |
| var. <i>microstachya</i> .....      | <i>Coccoloba microstachya</i>                      |
| var. <i>parvifolia</i> .....        | <i>Coccoloba microstachya</i>                      |
| <i>Coccoloba rugosa</i> .....       | <i>Coccoloba rugosa</i>                            |
| <i>Coccoloba tenuifolia</i> .....   | <i>Coccoloba diversifolia</i>                      |
| <i>Coccoloba uvifera</i> .....      | <i>Coccoloba uvifera</i>                           |

**Coccoloba** P. Br. ex L. Syst. Nat. ed. 10, 1007, 1367. 1759; Taxon 3: 114, 156, 233. 1954, nom. conserv.

*Guaibara* Miller, Gard. Dict. ed. 4, 2: 1754.

*Coccolobis* P. Br. Civ. Hist. Jam. 209, pl. 14, f. 3. 1756.

#### KEY TO THE SPECIES FOUND IN PUERTO RICO AND THE VIRGIN ISLANDS

Perianth lobes investing the achene; leaves usually membranaceous; ochreolar sheaths commonly elongating with the flowers; bracts usually black in color. .... *C. venosa*.

Hypanthium investing the achene, the perianth lobes appressed against the apex of the achene or coronate on the achene; leaves coriaceous to fleshy, rarely membranaceous; ochreolae not elongating with the flowers but broken early; bracts usually straw colored or brown.

Pedicels shorter than the ochreolae in flower and in fruit.

Leaves of normal shoots characteristically 2–5 cm. long.

Leaves ovate, cordate at the base, greenish tan in color even when fresh; venation inconspicuous above, primary veins evident by color



below; nodes swollen and bead-like when fresh but only slightly larger than internodal diameter when dry; fruit 4–5 mm. long, strongly triangular in cross section ..... *C. krugii*.

Leaves ovate-oblong, normally rounded at the base and not cordate, dark brown to black on drying; primary and secondary veins conspicuous on both surfaces, densely reticulate; nodes bead-like, swollen and conspicuously larger than the internodal diameter when dry; fruit round in cross section, not angled. .... *C. microstachys*.

Leaves of normal shoots characteristically 7–12 cm. long.

Leaves normally ovate-lanceolate; venation mostly inconspicuous on both leaf surfaces; blades characteristically and conspicuously lighter in color below when dry; fruit globose, ca. 4 mm. in diameter. .... *C. pyrifolia*.

Leaves mostly broadly ovate to elliptic; primary veins conspicuous on both surfaces, secondary venation finely reticulate, evident but not conspicuous; blades only slightly lighter in color below; fruit ovoid, 8–10 mm. long, 6 mm. diameter.

Leaves thick and fleshy when fresh, heavy and coriaceous when dry; inflorescence axis stout, the flower clusters often appearing to be sunken in the axis. .... *C. swartzii* f. *urbaniana*.

Leaves not evidently thick and fleshy, when dry only thinly coriaceous; inflorescence axis not fleshy, the flower clusters not imbedded in the axis. .... *C. swartzii*.

Pedicels longer than the ochreolae in flower and in fruit.

Leaves large, usually 25 cm. wide or more.

Leaves bullate between the primary veins, glabrous, the basal lobes of the blade often surrounding the stem; stem angled or keeled, when dry conspicuously so; inflorescence red. .... *C. rugosa*.

Leaves reticulate but not bullate, pubescent at least when young; stems not evidently angled; inflorescence not noticeably red in color. .... *C. pubescens*.

Leaves smaller, usually less than 10 cm. wide, rarely 15–20 cm. wide, never strongly bullate or with lower leaf surface deeply chambered by the protruding veins.

Leaves suborbicular, thick and fleshy, one basal lobe of the blade usually overlapping the petiole; fruit obpyriform 1.2–2 cm. long. .... *C. uvifera*.

Leaves ovate to elliptic or obovate.

Fruit obpyriform, broadest above the middle; leaves with one basal lobe slightly overlapping the petiole. .... *C. uvifera* × *C. krugii*.

Fruit broadest below the middle; leaf bases variable but without a basal lobe overlapping the petiole.

Inflorescences with 10 to 20 pistillate flowers or clusters of staminate flowers. .... *C. diversifolia*.

Inflorescence with 50 or more pistillate flowers or clusters of staminate flowers.



Inflorescence and flowers red, pedicels 4–5.5 mm. long.  
 ..... *C. sintenisii*.

Inflorescence and flowers usually green, not bright red; pedicels 1.5 mm. long.

Primary venation conspicuous, secondary venation inconspicuous. .... *C. costata*.

Primary venation and secondary venation conspicuous, finely reticulate. .... *C. uvifera* × *C. krugii*.

**Coccoloba venosa** L. Syst. Nat. ed. 10, 1007. 1759; Fawcett & Rendle, Jour. Bot. 51: 123. 1913; Britton & Wilson, Sci. Surv. P.R. 5: 269. 1924; Howard, Jour. Arnold Arb. 30: 398. 1949.

*Coccoloba punctata* L. Sp. Pl. ed. 2, 523. 1762.

*Coccoloba nivea* Jacq. Hist. Stirp. Amer. 115, pl. 78. 1763; Enum. Pl. 19. 1762.

Trees to 10 m. tall; branches terete, glabrous, the nodes not tumid; ochreae membranaceous, deeply cleft, acuminate on one side, or truncate, to 2 cm. long, glabrous or with flattened glands; leaf blades oblong-lanceolate to elliptic, the apex short acuminate, the base narrowed and slightly cordate or cuneate or obtuse,  $8 \times 4$ ,  $10 \times 4.5$ ,  $16.5 \times 6.5$ ,  $21 \times 9$ ,  $27 \times 10.5$  cm. long and broad, membranaceous, glabrous except for clusters of hairs in the axils of the veins, sparsely glandular below; midrib and primary veins slightly prominent on both surfaces, the primary veins 8–13 pairs, straight or arcuate, bifurcate and anastomosing at the margins, the petioles 5–10 mm. long, glabrous; leaves of the adventitious shoots about the same size, the internodes much elongate and the ochreae to 4 cm. long; inflorescence terminal or terminal on short lateral branches, the rachis puberulent, angular; staminate flowers in clusters of 2–5, the pistillate flowers solitary, the bracts lanceolate-ovate, to 1.5 mm. long, black, puberulent to pilose or commonly with a fringe of hairs at the apex; ochreolae membranaceous, enlarging with the expanding bud, each flower with an ochreola, to 2 mm. long, the flowering pedicels 1–2 mm. long, glabrous; hypanthium less than 0.5 mm. long, the perianth lobes broadly ovate, 1.5–2 mm. long and broad, slightly unequal, the fertile stamens to 1 mm. long; fruiting pedicels 1.5–2.5 mm. long, the fruit broadly ovoid, the perianth lobes fleshy, white or pink, enclosing the black achene, the hypanthium scarcely evident in the fruit, the fruit 3–4 mm. long and broad.

**DISTRIBUTION:** Cuba (introduced), Jamaica (in literature but no specimens have been located), Hispaniola, Puerto Rico and the Virgin Islands, and the Lesser Antilles to Trinidad and Tobago.

**Puerto Rico:** Aybonito to Buenvista de la Plata, *Sintenis* 2083 (GH, US); Cayey, *Sintenis* 2215 (NY); Coamo Springs, *Britton & Cowell* 1329 (NY, US), *Goll* 653 (US), 737 (US); Comerio, *Johnston* 920 (NY); Guanica, *Britton & Shafer* 1891 (NY, US); Gurabo, *Stevenson* 2899 (US); Humacao, *Sargent* 3014 (US); Las Pijeras, *Britton, Britton & Marble* 2219 (NY, US); Ponce to Coamo,



*Heller* 509 (NY, US); Ponce to Juana Mata, *Goll* 805 (US); Ponce to Santa Isabel, *Britton & Britton* 7342 (NY); Pumula, *Sargent* 9133 (NY); Sardinera, *Britton, Cowell & Hess* 1787 (NY); Yabucoa, *Eggers* 425 (B, GH); Yuncos, *Sintenis* 1942 (B, F, GH, MO, NY, S, US); without specific location, *Wydler* 347 (NY), *Schwanecke* s.n. (B). **Vieques Island:** Isabel Segunda, *Shafer* 2450 (NY, US). **St. Croix:** Crequis, *Eggers* s.n. (US); Caledonia Gut, *Eggers* s.n. (NY); Christiansted, *Quinn* 1130 (NY); Northside Belvidere, *Ricksecker* 456 (F, GH, MO, NY, US); Prosperity Hills, *Eggers* s.n. (A); without specific location, *Oersted* s.n. (US). **St. Thomas:** Collections by Crudy, Eggers, Forstrom and Oersted without specific location or collection numbers. **Tortola:** Sage Mt., *J. S. Beard* 330 (A, MO); Sea Cow Bay, *Shafer* 1125 (F, NY, US).

Beard reports this species to be called "Tribble Grape" on Tortola while it is commonly known as Chiggery Grape and Calambreña in Puerto Rico.

Britton and Wilson list *Coccoloba excoriata* L. as a synonym of this species in their treatment of the genus. The Linnean species, however, is properly referred to *C. tenuifolia* L. See Howard Jour. Arnold Arb. 28: 92-95. 1957.

**Coccoloba krugii** Lindau, Engler Bot. Jahrb. 13: 145. 1890, Symb. Antill. 1: 222. 1899; Britton & Wilson, Sci. Surv. P.R. 5: 267. 1924; Howard, Jour. Arnold Arb. 37: 337. 1956.

*Coccoloba borgesensis* Schmidt, Fedde Repert. Sp. Nov. 24: 75. 1927.

*Coccoloba borgesensis* forma *ovato-lanceolata* Schmidt, Fedde Repert. Sp. Nov. 24: 76. 1927.

Shrub or small tree to 6 m. tall; branches terete, glabrous, slightly geniculate and nodose; ochrea membranaceous, persistent, 3-5 mm. long; petioles borne at the base of the ochrea, corky at the base, 5-6 mm. long; blade ovate to suborbicular  $2 \times 1.8$ ,  $4 \times 3.5$ ,  $5 \times 4$  cm. long and broad, thin-coriaceous, glabrous or rarely with a few hairs near the attachment of the petiole, the margin flat or recurved, the midrib flat above slightly prominent below, the primary veins 4-6 pairs, straight, bifurcating and anastomosing near the margin, flat on both surfaces, the secondary venation minutely reticulate below, smooth above, the apex obtuse or rounded, the base cordate or rounded; adventitious leaves from the base of the 1 cm. long ochrea with petioles 1 cm. long and blades cordate or elliptic to  $7 \times 6$  cm. long and broad; inflorescence terminal, 5-8 cm. long, rachis glabrous, the staminate flowers 1-3 per node, the pistillate flowers borne singly, the bracts broadly ovate, membranaceous, 1 mm. long; ochreolae membranaceous, flaring to 1 mm. long; pedicels wanting or shorter than the ochreolae, the hypanthium 1 mm. long, the perianth lobes ovate, to 2 mm. long, the filaments of fertile stamens 1.5 mm. long; fruit ovoid or angularly fusiform, strongly triangular in outline, 4-5 mm. long, 3-3.5 mm. in diameter, the perianth lobes appressed, above half the length of the fruit.

**DISTRIBUTION:** Bahamas, Haiti, Dominican Republic, Jamaica, Puerto Rico, Anagada, Antigua, Barbuda, St. Martin.



**Puerto Rico:** Guanica near Salinas, *Britton, Britton & Boynton* 8314 (NY); Guanica in woods on Monte Cobana, *Sintenis* 3776 (MO, NY); Ponce, *Underwood & Griggs* 673 (NY, US); *Heller* 6211 (A, F, GH, MO, NY, US); *Britton & Cowell* 1289 (NY, US); Icacos Cay, *Britton* 7153 (NY); Vieques Island, *Shafer* 2785 (NY, S, US); Guayanilla, *Britton & Shafer* 1841 (F, MO, NY, US). **Anagada:** *Fishlock* 26 (NY), 27 (NY); *Britton & Fishlock* 1001 (NY), 1063 (F, NY, MO, US), *J. Beard* 323 (A).

***Coccoloba krugii* Lind.  $\times$  *C. uvifera* L., hybr. nov.**

Shrub of 6 feet or small tree; young branches terete, striate, puberulent to pubescent; ochrea membranaceous, oblique and slightly flaring at the apex, 1–1.5 cm. long, puberulent to pubescent; leaves of normal shoots on petioles 7–10 mm. long, blades ovate to ovate-elliptic, apex obtuse to broadly rounded, rarely acuminate with an obtuse point, the base oblique, cordate to rounded, one basal lobe often overlapping the petiole,  $6 \times 3$ ,  $8 \times 6$ ,  $11 \times 8$  cm. long and broad, the midrib and veins prominent below, sub-prominent above when dry, ultimate venation reticulate, primary veins 6–7, arcuate and anastomosing near the margin, 2–3 veins close to the base of the blade; leaves of adventitious shoots on petioles 7–10 mm. long, the blades ovate, ovate-elliptic or rarely ovate-lanceolate,  $14 \times 8$  to  $29 \times 18$  cm. long and broad; inflorescence simple, terminal to 20 cm. long, the rachis slender, puberulent becoming glabrate; bracts broad, triangular ovate, puberulent, the ochreolae membranaceous, to 1 mm. long, puberulent, the pedicels shorter than the ochreolae; staminate flowers 2–4 per node, the pistillate flowers solitary at the nodes, hypanthium to 1 mm. long, perianth lobes orbicular, 1.5–2 mm. long and broad, filaments of fertile stamens 2 mm. long; pedicels in fruit equal to twice the length of the ochreolae, fruit fusiform to fusiform-ovoid, 11 mm. long, 8 mm. in diameter, the perianth lobes not coronate.

**Puerto Rico:** Morrillos de Cabo Rojo, *Britton, Cowell & Brown* 4709 (F, NY, US); Ponce, *F. H. Sargent* 564 (US). **St. Croix:** La Vallee, *Ricksecker s.n.* (F); Oxholmia, *Borgesen* (C); Rustup Twist, *Ricksecker* 465 (F, GH, MO, NY, US); Saltpond, *Raunkiaer s.n.* (C); *Eggers* without location or number (C). **St. Thomas:** without specific location or number: *Eggers* (US), *Ehrenberg* (B), *Raunkiaer* (C); *Holdridge* 122 (NY). **Little St. James:** *Britton & Rose* 1407 (NY, US). **St. Jan:** *Raunkiaer s.n.* (C). **Virgin Gorda:** *Fishlock* 286 (GH), 353 (NY, US); *A. C. Smith* 10563 (A).

Judging from the variety of determinations which exist on the specimens cited above, the plants representing this hybrid swarm have caused difficulty to other taxonomists. In addition to the citations given, I have seen thirty-five other sheets with data as to locality, collector, or collector's number, which are insufficient to allow citation. Twenty-five such sheets from the Copenhagen herbarium are old collections obviously from the one-time Danish possessions in the West Indies. These specimens present a range of variation which includes the often diverse forms represented in the collections cited.



The majority of the specimens assigned to this hybrid population were sterile and represented portions of adventitious shoots. Some attached or associated fertile branches gave the impression of unusually large specimens of *Coccoloba krugii* through the long and tenuous inflorescence and through the fruit. In all but two collections the pedicels in both flower and fruit were short. A few specimens had associated fruits resembling those of *C. uvifera*.

Two collections from Virgin Gorda are referred to this hybrid population. One was made by W. C. Fishlock from the "mountain" and a more recent collection by A. C. Smith was more adequately described as a tree, 4–5 m. tall in low thick woods at the summit and on the eastern slope of Virgin Peak at an altitude of 150–420 m. These two collections represent a heavy and fleshy phase of the hybrid. They seem to bear the same relationship to the hybrid population as *C. swartzii* forma *urbaniana* does to *C. swartzii* on the mainland of Puerto Rico. The Fishlock material is in flower and the Smith specimen in fruit. Both specimens are gnarled in appearance and on both the leaves are variable in shape but predominantly broadly ovate. The apparent thickness or leathery appearance of the blades is striking. The apex is rounded and emarginate and the base strongly obliquely cordate. Representative leaves are  $6.5 \times 5$  to  $10.5 \times 8$  cm. long and broad. The venation is conspicuous on both surfaces and the ultimate venation coarsely reticulate. The inflorescence slightly exceeds the length of the leaves and the plants are dioecious. The pedicels of both the flowers and fruits in the collections by Fishlock and Smith are 1.5–2 mm. long. In the other collections cited the pedicels in flower and fruit are 1 mm. in length but appear smaller in contrast. Fishlock reported the common name of "white grape" for this plant on Virgin Gorda, while *C. uvifera* is known as "sea grape" and *C. krugii* as "white wood."

***Coccoloba microstachya*** Willd. Sp. Pl. 2: 459. 1800; Lindau, Engler Bot. Jahrb. 13: 146. 1890.

*Coccoloba parvifolia* Poir. in Lam. Encycl. 6: 64. 1804.

*Coccoloba klotzschiana* Meisn. DC. Prodr. 14: 155. 1856; Lindau, Engler Bot. Jahrb. 13: 148. 1890.

*Coccoloba microstachya* var. *ovalifolia* Meisn. DC. Prodr. 14: 162. 1856.

*Coccoloba microstachya* var. *lanceolata* Meisn. DC. Prodr. 14: 162. 1856.

*Coccoloba punctata* Griseb. in part, Flora Brit. W.I. 163, 1859, not Linnaeus.

*Coccoloba microstachya* var. *rotundifolia* Urban ex Lindau, Engler Bot. Jahrb. 13: 147. 1890.

*Coccoloba obtusifolia* Lindau, Symb. Antill. 1: 222, 1899; Britton & Wilson, Sci. Surv. P.R. 5: 268. 1924, not Jacquin.

Shrub or tree to 20 feet tall; branches terete, the nodes tumid, pubescent or with hair primordia, the bark gray to tan in color; ochrea membranaceous, cylindrical, pubescent, 4 mm. long; petioles 3–6 mm. long, flattened above, normally pubescent; blades variable in size and shape, ovate, ovate-lanceolate, oblong or elliptic,  $3.5 \times 1.5$ ,  $4 \times 2$ ,  $5.5 \times 3.5$  to  $7 \times 4$  cm.



long and broad, thin-coriaceous, usually turning black on drying, the margin entire, often undulate, sometimes tightly recurved; midrib and veins prominulous on both surfaces, forming a dense reticulum, although blades relatively thick and often somewhat fleshy in fresh condition, the veins 7–9 pairs, prominent or numerous and all equal and less conspicuous, straight or arcuate, curved and anastomosing at the margin; glabrous above, pilose or glabrate below, occasional hairs remaining on the veins or rarely the entire leaf surface persistently pubescent; apex acute, acuminate rounded or emarginate, the base narrowed, rounded or slightly cordate; leaves of adventitious shoots ovate-lanceolate,  $10.5 \times 5.5$  to  $16.5 \times 5$  cm. long and broad on petioles 7 mm. long with ochreae 8 mm. long, the adventitious leaves cordate at the base, generally tapering or acuminate at the apex and often conspicuously puberulent below; inflorescence terminal, 5–10 cm. long, the rachis usually pubescent, tenuous, rarely stout, often geniculate, commonly recurved; staminate flowers two, rarely one or more than two at the nodes; pistillate flowers solitary, the bracts broadly ovate, 0.5 mm. long, puberulent; ochreolae membranaceous, puberulent, to 0.5 mm. long, erect and surrounding the flower in the staminate plants, generally appressed or flattened against the rachis in the pistillate plants in flower and fruit, pedicels none or shorter than the ochreolae, the hypanthium less than 1 mm. long, the perianth lobes 1–1.5 mm. long and 1 mm. wide; fruit sessile, generally ovate with distinctly coronate perianth lobes, to 6 mm. long and 4 mm. in diameter.

**DISTRIBUTION:** Dominican Republic, Puerto Rico, St. Thomas, St. Jan, Tortola, Virgin Gorda, Anguilla and St. Croix.

**Puerto Rico:** Guayanilla: *Britton & Shafer* 1817 (F, GH, NY, MO, US); *Sintenis* 4868 (MO, US); Guanica, *Britton & Britton* 9594 (S), *Sintenis* 3707 (B), 3431 (MO, US), *Gregory* 181 (NY), *Holdridge* 181 (A); Mayaguez, *Heller* 4546 (A, B, E, F, GH, NY, Mich. MO, NY, US), *Britton, Cowell & Brown* 4359 (NY, US), *Britton & Hess* 2715 (F, NY, US); Ponce, *Heller* 6128 (A, E, F, GH, MO, NY, US), *Underwood & Griggs* 686 (NY, US); Cabo Rojo, *Sintenis* 545 (GH, S, US), *Velez* 1096 (NY); Cayo Muertos, *Britton, Cowell & Brown* 4999 (NY); Punta Guaniquilla, *Britton, Cowell & Brown* 4566 (F, GH, NY, US), 4573 (NY, US); Rincon, *Sintenis* 5498 (F, NY), 5543 (E, F, NY); Coamo, *Sintenis* 3328 (E, GH, S, US); Peñon, *Shafer* 1985 (NY, US); Cerro Ventana, *Shafer* 2976 (NY, US); Santa Maria to Caballo Colorado, *Shafer* 2689 (NY, US); Enseñada Hondo, *Britton & Britton* 9645 (NY). **Culebra Island:** *Britton & Wheeler* 8A (NY, US), 32 (F, NY, US). **Mona Island:** *Stevens* 6170 (NY), 6213 (NY), *Britton, Cowell & Hess* 1710 (NY). **Vieques Island:** *Shafer* 2805 (NY, US). **St. Thomas:** Bolongo Hill, *Eggers* 160 (C, S); Flaghill, *Eggers s.n.* (US); Bordeaux, *Britton & Marble* 1378 (C, F, NY, US), *Ostenfeld* 328 (C), 330 (C). Without specific location: *Eggers* 135 (B), 124 (GH), 714 (A), *Britton, Britton & Shafer* 159 (C, F, NY, US), *Paulsen* 146b (NY). Collector not specified: Herb. Kunth, type of *C. klotzschiana*. **St. Jan:** Bethania, *Britton & Shafer* 192 (NY, US); Solomon's Bay, *Eggers* 3314a (C). **Tortola:** *Fishlock* 124 (F, NY). **Virgin Gorda:** *Fishlock* 20 (GH, NY), 279 (GH, US). **Anguilla:** *Boldingh* 3483b (NY). **St. Croix:** Oxholmia, *Borgesen* 64 (C); Fair Plains,



*Eggers s.n.* (C); Kingshill *Eggers s.n.* (C); Salt River, *Paulsen 264* (C); Folly Hill, *Raunkiaer s.n.* (C); Rustup Twist, *Mrs. J. J. Ricksecker 365* (F, MO, US); Salt River Cliff, *A. E. Ricksecker 459* (F, GH, MO, NY, US); Christiansted, *Rose, Fitch and Russell 3582* (NY, US); Anna's Hope, *Thompson 398* (GH, NY); Mt. Eagle, *Thompson 434* (GH, NY).

The holotype of this species is *Willdenow 7703* in the Willdenow Herbarium in Berlin. In his original monograph of this genus, Lindau accepted *Coccoloba microstachya* Willd. and recognized three varieties. *Coccoloba microstachya* var. *ovalifolia* was described earlier by Meisner and included the holotype. *Coccoloba microstachya* var. *lanceolata* was described also by Meisner. Lindau describes a variety *rotundifolia* attributed as a manuscript name by Urban. In the synonymy of *C. microstachya* var. *ovalifolia*, Lindau cites *C. obtusifolia* Jacquin. The two specimens in the Willdenow Herbarium in Berlin are 7703, the type of the species, and 7702, the type of *C. microstachya* var. *lanceolata* Meisner. Both are probably from St. Croix and were probably collected by Vahl. Although Lindau listed four Sintenis collections from Puerto Rico, he failed to cite a type when he described *C. microstachya* var. *rotundifolia*.

In a later treatment of the genus for the West Indies (Symb. Antill. 1: 222. 1899), Lindau recognized the earlier publication of the Jacquin name *Coccoloba obtusifolia* and, accepting this as the correct name for the species, listed in synonymy *C. microstachya* and the three varieties recognized in his earlier publication. The rejection of the morphological varieties is based on a better understanding of the variation within this species and particularly within the development of an individual plant. I agree with Lindau's concept of the morphology of the species, but cannot agree with his acceptance of the name *C. obtusifolia* Jacquin. The description and illustration of the plant Jacquin considered *C. obtusifolia* is clearly not the same plant called *C. microstachya* and typified by the Willdenow specimens. Further, *C. obtusifolia* Jacquin is based on a plant from Carthagena in Colombia. This is the plant which Lindau describes as *C. billbergii* (Engl. Bot. Jahrb. 13: 219. 1890) and this species is not known from the West Indies.

Although Willdenow described *Coccoloba microstachya* as having glabrous leaves and stems, the type specimen in the Willdenow herbarium shows a minute but distinct pubescence. In the large number of specimens examined in the herbarium and in the field, the amount and the evidence of the indument varies. The pubescence is often represented only by bases of hairs recognized as clear, lighter colored dots or cells in the epidermis of the dried leaves. Generally a slight pubescence remains on the rachis of the inflorescence and is evident when all other portions of the specimen are glabrous. The extreme in foliar pubescence was seen on a specimen collected by Boldingh (3483B) from Anguilla where the lower leaf surface of the mature foliage was almost tomentose.

The variation in leaf shape is great, not only in populations but in individual plants. The three taxa which Lindau recognized in 1890, as he



reported later, can be found on a single plant or in a single collection. Within the fourteen sheets of the four Sintenis collections that I have examined, all three varieties can be recognized. Some of the herbarium specimens cited seem to have been selected deliberately in the field to show gross and exaggerated variations. The largest adventitious leaves are on the specimens from St. Croix and many of the collections consist only of such shoots and leaves. However, a Britton & Wheeler collection (32) shows both the large leaves of the adventitious shoots as well as the smaller leaves, presumably of the same plant although no mention is made of this in the field notes.

Several specimens from St. Croix show an almost teratological thickening of the inflorescence axis. While this is common in other species, and particularly in *Coccoloba swartzii*, it appears unusual in *C. microstachya*.

*Coccoloba parvifolia* Poir. is based on a Vahl collection and the type is in the Jussieu Herbarium. I have examined a photograph of the type sheet and agree that this species can be referred to the synonymy of *Coccoloba microstachya* Willd. Meisner, however, recognized this species and considered it an "obscure" species from South America. However, the Vahl collection is probably from St. Croix.

The type specimen of *Coccoloba klotzschiana* in the De Candolle Herbarium at Geneva and the fragment of this in the herbarium of the New York Botanical Garden indicate this species may also be referred to *C. microstachya*.

In the extreme forms of *Coccoloba microstachya*, it is difficult to distinguish between this and *C. swartzii*. Usually, however, *C. swartzii* may be recognized by the larger leaves, longer and thicker inflorescence axes, tapered fruit with imbricated perianth lobes, the lack of pubescence (except in forma *pubescens*) and the darker, almost black color of the leaves when dry. By comparison, *C. microstachya* has smaller leaves, tan to brown in color rather than black, exaggerated tumid nodes, shorter and more tenuous inflorescences and fruit with coronate perianth lobes.

***Coccoloba pyrifolia*** Desf. Cat. Hort. Paris ed. 3, 69, 389. 1829; Howard, Jour. Arnold Arb. 37: 335. 1956.

*Coccoloba pirifolia* Lindau, Engl. Bot. Jahrb. 13: 144. 1890, Symb. Antill. 1: 222. 1899.

*Coccolobis pirifolia* Lindau, Brit. & Wils. Sci. Surv. P. R. 5: 267. 1924.

*Coccoloba kunthiana* Meisner, DC. Prodr. 14: 166. 1857.

*Coccoloba punctata* var. *jacquini* Griseb. Fl. Brit. W. I. 163. 1859.

Shrub of 9 ft. to a tree of 30 ft.; trunk to 14 inches diameter at breast height; branches striate, glabrous, the nodes not conspicuously swollen; ochrea subcoriaceous, glabrous, shriveling rather than deciduous, 1 cm. long; petiole inserted below the ochrea, glabrous, 0.6–1.5 cm. long; blade ovate-lanceolate, broadly ovate or occasionally completely orbicular, 4.5 × 2.5, 9 × 5, 12 × 6 cm. long and broad, coriaceous, glabrous, opaque to almost shining, the margin entire, sometimes recurved, the midrib



slightly evident below, prominent above, the primary veins flat, slightly impressed above, very slightly evident below, the secondary venation obscure, the apex obtuse, acute or rarely acuminate, the base rounded, narrowed or sub-cuneate; inflorescence terminal, spike-like, 1–2 times the length of the leaf or terminal on lateral shoots, 8 to 31 cm. long, glabrous, the staminate and pistillate flowers borne singly, the bracts triangular to 1.5 mm. long, the ochreolae membranaceous, equalling the bracts; pedicels wanting; hypanthium 1 mm. long, the perianth lobes ovate, to 2 mm. long, the filaments of fertile stamens 3 mm. long; fertile pistil to 2.5 mm. long; fruit globose, ca. 4 mm. in diameter, rounded at the base, obscurely 3-angled, the perianth lobes coronate, laxly acuminate; achene tan in color.

DISTRIBUTION: Endemic to Puerto Rico.

**Puerto Rico:** Mayaguez, *Cowell* 730 (F, US), 731 (F, NY, US), *Otero & Alvarez* 540 (A, F), *Sintenis* 1018 (BM, US), *Heller* 4560 (A, E, F, GH, Mich., MO, NY, US); Sierra de Luquillo, *Sintenis* 1405 (F, MO, S), 1501 (BM, GH, NY, US), *Britton & Bruner* 7551 (NY); Santurce, *Heller* 614 (F, NY, US), 1259 (F, NY), 1268 (NY, US); La Estancita, *Eggers* 1173 (US); Mt. Alegrillo, *Britton, Stevens & Hess* 2572 (F, MO, NY, US), *Sintenis* 238 (GH, MO, S, US), *Hess* 645 (NY); Vega Alta, *Britton, Britton & Brown* 6796 (F, NY, NEOTYPE; US); Camuy, *F. H. Sargent B-200* (US); Guayamo, *Britton, Britton & Brown* 6544 (F, NY, US); Martin Peña, *J. R. Johnston* 1867 (NY, US); Mt. Morales, *Britton & Marble* 1058 (NY, US); Maricao, *F. H. Sargent* 397 (US); Bayamon, *Sintenis* 990 (BM, GH, US), *Britton, Britton & Boynton* 8455 (GH, NY, US); Lago San Jose, *Hioram* 372 (NY); Vega Baja, *Stevens* 1932 (NY); Yauco, Indiera Baja, *Britton & Britton* 7227 (NY); Cayey, *Otero* 730 (A, NY); Espinosa above Toa Baja, *Britton & Britton* 9709 (NY); San Juan, *Gerhart & Holdridge* 536 (NY); Cataño, *Britton, Britton & Brown* 6980 (NY); Sierra de Naguabo, *Shafer* 3480 (NY); Toro Negro, Doña Juana, *Gregory* 54 (NY).

*Coccoloba pyrifolia* Desfontaines was described in the third edition of the catalogue of plants in the botanic garden at Paris and was based on material under cultivation there. The origin of the plant is given as the warmer Antilles. No holotype exists for this species and no lectotype has been selected, to the best of my knowledge. There is in the herbarium at Geneva a specimen without collector's name or date, bearing a label indicating its origin as "hort. paris." It is possible that this specimen represents the original material cultivated and described in 1829 and could possibly be considered as the type. It seems more desirable to select a neotype from more recent collections and so *Britton, Britton & Brown* 6796 is designated the type collection, and is deposited at the New York Botanic Garden herbarium. The species has been reported from Puerto Rico, St. Thomas, Cuba and Jamaica. I have seen the collections which Lindau cited from the herbaria at Berlin and Göttingen and there are currently no collections from St. Thomas. Lindau's reference to the occurrence of this species on St. Thomas cannot be checked. Likewise the Wilson specimen from Jamaica which Lindau states is in the Grisebach Herbarium cannot be located. Fawcett & Rendle repeat this reference



which cannot be verified. The two collections by Charles Wright from Cuba which Sauvalle refers to this species in his *Flora Cubana* (139. 1873) are *Wright 2253* which is *Coccoloba praecox* Wright ex Lindau and *Wright 2256* which is the type of *C. reflexa* Lindau. It appears that *C. pyrifolia* is currently limited to Puerto Rico. The original spelling of the specific name is retained in this treatment, although all recent authors have preferred to use *Coccoloba pirifolia*.

Meisner's original description of *Coccoloba kunthiana* contains few diagnostic characters and is clearly referable to the synonymy of this species. I have seen specimens in the De Candolle Herbarium on which Meisner's species is based and conclude that the differences recognized by various authors in the past have been primarily of growth characters. The plants with older and shorter compacted branches are named *C. kunthiana* and are similar to Meisner's type. These specimens also have smaller ovate leaves which are generally obtuse at the apex. Specimens from obviously faster growing shoots have larger leaves which are acute or acuminate at the apex and possess longer inflorescences. These specimens, almost without exception, have been referred to *C. pyrifolia*. It is quite clear from a study of the material cited and from a field knowledge of the species that only a single taxon is represented and that the larger acute leaves are produced on adventitious or vigorously growing shoots.

*Coccoloba pyrifolia* is easily recognized by the long thin inflorescences with sessile flowers. It is most easily distinguished from *C. swartzii* by having leaves which dry dark brown and almost shiny above and light brown or tan beneath and which have very inconspicuous venation.

***Coccoloba swartzii*** Meisner, DC. Prodr. 14: 159. 1856; Lindau, Engler Bot. Jahrb. 13: 157. 1890; Howard, Jour. Arnold Arb. 30: 420. 1949, 37: 324. 1956.

*Coccoloba swartzii* var. (?) *portoricensis* Meisn., DC. Prodr. 14: 160. 1856; Lindau, Engler Bot. Jahrb. 13: 157. 1890; Britton & Wilson, Sci. Surv. P.R. 5: 270. 1924.

*Coccoloba barbadensis* Lindau, Engler Bot. Jahrb. 13: 148. 1890, not Jacq.

*Coccoloba diversifolia* Lindau, Symb. Antill. 1: 223. 1899; Britton & Wilson, Sci. Surv. P.R. 5: 267. 1924.

*Uvifera swartzii* Ktze., Rev. Gen. 2: 562. 1891.

*Coccoloba neglecta* Fawcett & Rendle, Jour. Bot. 51: 124. 1913; Flora Jam. 3: 116. 1914.

*Coccoloba punctata* Grisebach, Krebs, Eggers, and Northrop, not Linnaeus.

*Coccoloba coronata* of Millspaugh, not Linnaeus.

Trees 8–20 m. tall; branches terete, the youngest puberulent, becoming glabrate, the nodes slightly tumid; ochrea 10–12 mm. long, the basal portion 3–5 mm. long, coriaceous, persistent, the upper portion 5–7 mm. long, membranaceous, deciduous, puberulent to glabrate; petiole attached at the base of the ochrea, 10–18 mm. long, puberulent or glabrate; leaf blades ovate to elliptic,  $2.2 \times 1.3$ ,  $7 \times 5$ ,  $11 \times 9$ ,  $15 \times 7.5$  cm. long and broad,



entire, coriaceous, usually turning black on drying, glabrous, pit-like depressions on the upper surface, small glands on the lower surface, the midrib and veins inconspicuous or flat above, prominent below, the primary veins 6 or 7 pairs, arcuate anastomosing, secondary venation conspicuous, reticulate, the apex acute, often rounded, the base narrowed, rounded or slightly cordate, usually oblique; leaves of adventitious shoots on petioles 1.5–2.5 cm. long, the blades generally ovate to lanceolate,  $23 \times 8.5$ ,  $45 \times 18.5$  to  $70 \times 25$  cm. long and broad, the apex acute to acuminate, the base rounded; inflorescence terminal, 10–15 cm. long, the rachis glabrous or with glandular exudate, rarely papillose; staminate flowers in clusters of 3–5 flowers with tightly concentric membranaceous ochreolae forming a truncate cylinder after the flowers have fallen; pistillate flowers solitary, the ochreolae erect in flowers, flattened against the rachis in fruit, the bracts ovate, 1–1.5 mm. long, the ochreolae membranaceous 1–1.5 mm. long, the flowering pedicels shorter than the ochreolae, the hypanthium 0.5 mm. long, the perianth lobes 1–1.5 mm. long, the fertile stamens with filaments 1 mm. long; fruit ovoid 8–10 mm. long, 6 mm. in diameter, the perianth lobes 1–1.5 mm. long coronate in fruit.

DISTRIBUTION: Jamaica, Bahamas, Dominican Republic, Puerto Rico, St. Croix, Vieques Island, St. Jan, Virgin Gorda, St. Thomas, Saba, St. Kitts, Montserrat, Antigua, Guadeloupe, Dominica, Martinique, St. Lucia and Barbados.

Puerto Rico: Lago San Jose, *Hioram s.n.* (NY); Maricao, *Sintenis 258* (B, GH, MO, NY, S, US); Dorado, *Britton, Britton & Brown 6741* (F, NY); Cayey to Aibonito, *Britton & Britton 9630* (NY); Monte Montoso, *Britton & Cowell 4125* (F, NY, US); La Estancita, *Eggers 1193* (US); Santurce, *Heller 4666* (A, F, GH, Mich., NY, US). St. Croix: Salt River, *Thompson 580* (US); Sandy Point, *Raunkiaer 2508* (C); Jolly Hill, *Raunkiaer s.n.* (C); Mt. Eagle, *Thompson 427* (G, NY); Signal Hill, *Ricksecker 448* (F); Water Gut, *Isert s.n.* Vieques Island: *Shafer 2733* (NY, US). St. Jan: Mt. Eagle, *Ravn s.n.* (C). Virgin Gorda: *Fishlock 126* (NY). St. Thomas: *Oersted s.n.* (US).

A full discussion of the identification of *Coccoloba swartzii* Meisner and the application of the name *Coccoloba barbadensis* Jacquin was published in the Journal of the Arnold Arboretum as the second paper in this series (37: 317–339. 1956). Specimens from Puerto Rico now assigned to this species would previously have been referred to *C. swartzii* var. *portoricensis*, being intermediate in all characters between the typical expression of *C. swartzii* from Jamaica, the type locality, and *C. swartzii* var. *urbaniana* (*C. borinquensis* Britton). The specimens from St. Croix and other of the Virgin Islands are unlike the few plants from Puerto Rico and more similar to specimens from the Lesser Antilles. Considering the species as it occurs in many populations from Jamaica and Hispaniola south to Barbados and St. Lucia, there is no question that the Puerto Rican specimens are only slight variations in a greater range and should be included in the typical variety of *C. swartzii*.



In their studies for the Flora of Puerto Rico, Britton and Wilson assigned these specimens to *C. diversifolia* Lindau. I have already pointed out the general misapplication of this name (Jour. Arnold Arb. 30: 421. 1949).

*Coccoloba swartzii* forma *urbaniana* (Lindau) Howard, Jour. Arnold Arb. 37: 328. 1956.

*Coccoloba urbaniana* Lindau, Engler Bot. Jahrb. 13: 155. 1890 in part, Symb. Antill. 1: 225. 1899.

*Coccolobis borinquensis* Britton, Sci. Surv. P.R. 5: 267. 1924.

DISTRIBUTION: Endemic to Puerto Rico.

**Puerto Rico:** Sierra de Naguabo, Loma Icaco, *Shafer 3448* (NY, TYPE of *C. borinquensis*), *Britton, Britton & Cowell 207* (NY); Sierra de Luquillo, *Sintenis 1527* (F, GH, HOLOTYPE; MO, NY, S, US), *Wilson 213* (F, NY, US), *Gregory 56* (NY), *Britton & Bruner 7665* (NY), 7676 (NY), *Barbour & Gerhart 9729* (NY); Indiera Baja, *Britton & Britton 7228* (GH, NY, US); Camp Dona Juana, Villalba, *Gregory 64* (NY); Maricao Forest, *Sargent A-13* (US), *R. A. Howard 12602* (GH), *Winters 2213* (A).

Lindau described *Coccoloba urbaniana*, citing four collections, two by Crueger (2694 & 2692) from Trinidad and two by Sintenis (1527 & 1585) from Puerto Rico. His description, however, is obviously based on the material from Puerto Rico. No holotype was selected at the time. In his second publication of monographic studies on the genus *Coccoloba* in the Symbolae Antillanae, Lindau lists and keys *Coccoloba urbaniana*, but cites only the Sintenis collections. In fact, the two Crueger collections are not cited anywhere in this publication. It appears that Lindau was, in practice, accepting the species *Coccoloba urbaniana* for Puerto Rico by excluding the Trinidad material.

Britton in 1924 described *Coccoloba borinquensis*, selecting *Shafer 3448* as the type specimen. He reports that this collection had been "erroneously included by Lindau in *Coccoloba Urbaniana* Lindau of Trinidad." The Shafer material was collected in 1914 and I can find no indication that Lindau saw the type specimen at the New York Botanical Garden or any duplicates or fragments of this collection. I can only conclude that Britton was referring to a misidentification and that he had overlooked the later Lindau reference which essentially limits the species to Puerto Rico.

*Coccoloba borinquensis* Britton has been considered endemic to Puerto Rico and has been collected many times, principally in the Luquillo Mountains and the Maricao National Forest. I have studied several populations of this plant in areas similar to mossy forests where it was most abundant. The species as recognized by Britton is a shrub, or rarely a small tree, and is characterized by anomalous and apparently teratological development of the inflorescence axis and the leaves. Both are enormously thickened in living condition and when dried as specimens. In many specimens the rachis thickens as the fruit develops, so that when the fruit falls,



the pedicel is immersed in the fleshy axis tissue and the dried inflorescence axis appears to be deeply pitted. The anomalies in the collections cited are numerous. In collections by Sargent, Wilson and Gregory the axis varies in thickness along its length, being thin, almost tenuous at the base and swollen in the middle and at the apex. Many of the specimens in the collection by Sintenis are thickened and branched at the upper end. One of the specimens collected by Gregory is flattened and obviously fasciated at the apex.

The leaves likewise show variation of an anomalous nature in both living condition and when dried. Many of the leaves seemed almost succulent when fresh, but thick and heavy rather than coriaceous when dry. The veins vary in the degree of prominence in the specimens cited, but such a character is not taxonomically reliable.

Populations of this plant seen in Puerto Rico and the collections on hand show a definite gradation of the characters Britton used to identify this species into the typical form of *Coccoloba swartzii*. However, the conspicuous nature of the abnormality in the field as well as in the herbarium makes it desirable to acknowledge these Puerto Rican populations as forms.

Meisner described with a query a variety of *Coccoloba swartzii* called var. *portoricensis*. Subsequent monographers and workers on the West Indian flora have been unable to place this taxon. Lindau in 1890 studied a drawing of the specimen Meisner cites and thought it might be related to *Coccoloba diversifolia* Jacq. (*C. laurifolia* Lindau) or *Coccoloba swartzii* Meisner (*C. diversifolia* or *C. barbadensis* Lindau). Meisner did not give the name of the collector and as Britton did not recognize *Coccoloba swartzii* Meisner from Puerto Rico, he also was unable to associate the variety Meisner described with any other species. I have seen the Meisner material at the De Candolle Herbarium in Geneva. It was collected by C. G. Bertero in 1820. A portion of this collection appears in the material I have on loan from the Missouri Botanical Garden herbarium. The Bertero material typifying *C. swartzii* var. *portoricensis* is intermediate between the anomalous *C. swartzii* forma *urbaniana* and the typical *C. swartzii*. It is easily matched by material from the Dominican Republic collected near Puerto Plata and specimens from Seibo, by other collections from Puerto Rico and by some from Jamaica. *Coccoloba swartzii* forma *urbaniana* intergrades through material such as *Coccoloba swartzii* var. *portoricensis* into typical material of *C. swartzii*. The transition is so gradual and yet so complete throughout a number of collections that it is impossible to recognize the Meisner variety as a valid taxon.

*Coccoloba rugosa* Desf. Cat. Hort. Paris, ed. 3, 389. 1829; Weddel, Ann. Sci. Nat. ser. 3, 13: 262. 1849; Meisner, DC. Prodr. 14: 152, 1856; Lindau, Engl. Bot. Jahrb. 13: 203. 1890.

*Coccolobis rugosa* Brit. & Wils., Sci. Surv. P.R. 5: 269. 1924.

*Coccoloba macrophylla* Desf. Tabl. 38. 1804, nomen; Desf. ex Hooker, Bot. Mag. 76: t. 4536. 1850.

*Coccoloba macrantha* Steud. Nom. 1: 390. 1821, nomen.



Shrub or tree to 15 m. tall, trunk to 10 cm. diameter breast height, frequently unbranched or with few very long erect strict branches, these stout, sulcate-angled to almost winged or sharply ridged, glabrous, ochreae 4–7 cm. long, rigid, coriaceous, oblique at the apex, persistent; petioles very short or wanting; leaf blades obovate or rhomboidal when young becoming orbicular to obovate,  $25 \times 26$ ,  $37 \times 42$  to  $60 \times 45$  cm. long and broad, rigid coriaceous, conspicuously bullate or wrinkled, the margin recurved, glabrous, venation immersed above, prominent below, ultimate nerves conspicuous, blade punctate dotted above, appearing punctate below due to heavy lignification in mesophyll around veins, apex obtuse, base cordate to cordate clasping, the basal lobes often extending 15 cm. below the petiole; inflorescence terminal, 30–45 rarely to 75 cm. long, densely flowered, minutely puberulent, ochreae of inflorescence axis to 4 cm. long, membranaceous above, coriaceous below, slightly puberulent, staminate flowers in clusters of 4 to 18, the pistillate flowers in clusters of 2–6, bracts lanceolate, acute, 1–2 mm. long, puberulent, ochreolae, membranaceous, to 1.5 mm. long, puberulent, pedicels 5–13 mm. long, puberulent, hypanthium 2 mm. long, perianth lobes 1.5 mm. long, ovate, reflexed at maturity of flower, stamens 6–12, usually 8, functional stamens with filaments 2 mm. long, pistil rudiment shorter, sterile stamens 1 mm. long, functional pistil 1.5–2 mm. long, styles 1 mm. long; fruit ovoid, orange red in color, obscurely 3-angled, slightly constricted to a short stipitate base, the apex acute with the achene generally protruding beyond the perianth lobes when mature, mature fruit 5–7 mm. long, 3–5 mm. in diameter, perianth lobes appressed and imbricated, not coronate.

DISTRIBUTION: Endemic to Puerto Rico.

**Puerto Rico:** Catano, *Britton & Britton 9334* (NY, US), *Britton, Britton and Brown 6994* (F, GH, NY, US); Cayey, *Sintenis 2171* (GH, US); Humacao, *Sintenis 5178* (B, G, GH, MO, S, US); Lago San Jose, *Hioram s.n.* (NY), *Dale s.n.* (NY); Martin Peña, *Stevenson 1424* (US); Santurce, *Heller 1358* (F, NY, US); Sierra de Luquillo, La Estancita, *Eggers 827* (B, G, GH), *Eggers 655* (C); Sierra de Naguabo, *Shafer 3671* (NY, NEOTYPE; US). CULTIVATED SPECIMENS: Hort. Paris (C, G, GH).

Desfontaines in a series of publications listed the species of *Coccoloba* growing under cultivation in the Botanical Gardens in Paris. In one of these lists published in his *Tableau de l'école de botanique du Muséum d'Histoire Naturelle* (Paris), p. 18. 1804, Desfontaines lists the name *Coccoloba macrophylla* but as a nomen nudum without a description. In the second edition of the same work, page 46, 1815, *Coccoloba macrophylla* is not listed and a new name, *Coccoloba rugosa*, is given but without a description. *Coccoloba rugosa* is also listed in the third edition (1829) of the Catalogue and this time validly published with a description on page 389.

Specimens of *Coccoloba rugosa* were widely distributed to other botanical gardens in that period and numerous specimens are found in European herbaria, generally without data other than the name and the notation,



"hort. paris." In Geneva, for example, there are four sheets of this species, two labelled *Coccoloba rheifolia*, one labelled *Coccoloba macrophylla* and one sheet labelled *Coccoloba rugosa* and indented under this name *Coccoloba macrophylla*. W. J. Hooker was unable to find a description of this apparently widely cultivated plant and so in 1850, with John Smith, published a plate illustrating *Coccoloba macrophylla* and a description in the Botanical Magazine (76: *pl.* 4536. 1850). The plant was then under cultivation at Kew and its source was given as Desfontaines. The description and illustration of Hooker and Smith was copied, translated and republished by Lindley and Paxton (Flor. Gard. 1: 191, *f.* 94. 1850-1) and Lemaire (Jard. Fl. 1: *tab.* 47. 1851 and Fl. de Serres 6: 267, *tab.* 617. 1850). Planchon apparently saw the later publication and in Fl. de Serres 7: 160. 1851 referred to an earlier publication of Weddel (Ann. Sc. Nat. 3rd. ser. 13: 262. 1849) which stabilized the nomenclature by placing *Coccoloba macrophylla* in synonymy with *Coccoloba rugosa*.

Hooker makes the suggestion that Desfontaines himself realized the unsuitability of the epithet *macrophylla* for this species and adopted the more appropriate name of *Coccoloba rugosa*. Previous students of this group have failed to indicate a type specimen. Although horticultural material from Paris is available, the specimens seen are either sterile or with immature flowers. *Shafer 3671* has been selected as the type number. It is a pistillate plant with mature fruit and this neotype is the specimen in the herbarium of the New York Botanic Garden.

Both Meisner in his treatment of the species for the Prodrum and Lindau in his monograph refer to specimens of this species from St. Thomas. Britton and Wilson report the plant is "not known on St. Thomas at the present time; it may have grown there before the forests were cut away." The specimen from St. Thomas in the Delessert Herbarium was attributed to *Ventenat 142*. A similar specimen in the Copenhagen Herbarium collected by Ventenat originated in the Vahl Herbarium. The reference of these two specimens to St. Thomas can be seriously questioned. I was unable to locate the species growing in St. Thomas in 1950.

The specimens mentioned above which originated as "hort. paris" bearing the name *Coccoloba rheifolia* raise the question of the correct assignment of this species described by Desfontaines to *Coccoloba latifolia* Lam. as Lindau has done (Engler, Bot. Jahrb. 13: 133. 1890). Certainly the flowering specimens cited bearing the name *C. rheifolia* should be assigned to *C. rugosa*.

*Coccoloba rugosa* is similar to *C. sintenisii* in having the long pedicels and brightly colored inflorescences. *Coccoloba rugosa* is easily distinguished by the larger sessile and rugose leaves. It is known in Puerto Rico as "ortigon."

*Coccoloba pubescens* L. Syst. Nat. ed. 10, 1007. 1759; Hooker, Bot. Mag. 59: *t.* 3166. 1832; Fawcett & Rendle, Jour. Bot. 51: 123. 1913.

*Scortea arbor Americana, amplissimis foliis, aversaparte nervis extantibus*



*hirsutie ferruginea refertis*; Plukenet, Phytographia t. 222, f. 8. 1691.

*Coccoloba rubescens* L., Sp. Pl. ed. 2. 523. 1762, lapsus calami.

*Coccoloba grandifolia* Jacq., Enum. 19. 1760.

*Coccolobis grandifolia* Brit. & Wils., Sci. Surv. P.R. 5: 269. 1924.

*Coccolobis pubescens* Sandwith, Jour. Bot. 78: 98. 1940.

*Coccolobis antiguensis* Sandwith, Jour. Bot. 78: 98. 1940.

Mature tree to 40 feet tall, diameter 12 inches, much branched above; adventitious shoots generally strict and sparsely branched, to 30 feet tall; branches stout, terete, slightly swollen at nodes, strongly grooved or striate; ochreae 2 cm. long, membranaceous and evanescent above, coriaceous and persistent below; petioles stout, 1–2 cm. long, densely tawny pubescent; blades large, generally orbicular, except for terminal leaf, frequently broader than long,  $30 \times 40$ ,  $50 \times 80$  cm. long and broad, coriaceous, rugose or bullate when mature, thin and plane when young, apex rounded, base rounded to cordate, the basal lobes commonly encircling the stem, terminal leaflet commonly rhombic, longer than broad when mature, densely tomentose; veins slightly impressed above, all venation conspicuous and reticulate below, midrib and secondary veins persistent pubescent above, the others sparsely pubescent when young becoming glabrate above, margin irregular commonly undulate; mature branches terete, swollen at the nodes, lenticels not conspicuous, tomentose to pilose; ochreae to 1 cm. long, generally completely deciduous, pubescent; mature shoot leaves vary considerably in size and shape, leaves of completely mature plant (as represented by *Howard* 12143, 12352) with petioles 3–6 mm. long, inserted below the ochreae, densely short pubescent, blades broadly orbicular to orbicular-ovate,  $7.5 \times 10$ ,  $4 \times 6$  cm. grading into size of leaves of adventitious shoot, rugose or bullate; apex rounded, base cordate, the lobes rounded and only rarely approximate, sparsely pubescent above to glabrate, densely or sparsely pubescent below or glabrate, margin undulate, venation of 5 pairs of primary veins, arcuate to the margin, strongly anastomosing, slightly impressed above, conspicuous and reticulate below; inflorescence terminal, often stout, basal ochreae to 7 mm. long, membranaceous, peduncle to 1.5 cm. long, rachis minutely and often densely puberulent, 10–18 cm. long on mature shoots, to 45 cm. long on adventitious shoots, bracts broadly ovate, about 1 mm. long, puberulent, ochreolae membranaceous, spreading, 1 mm. long, minutely puberulent or glabrate; staminate flowers 2–4 per locus, pedicels 2–3 mm. long, puberulent, perianth lobes broadly orbicular 1.5 mm. long, 2 mm. wide, puberulent outside, hypanthium 0.5–1 mm. long, filaments 2 mm. long, anthers 0.5 mm. long, pistillate rudiments glabrous, 0.5–1.5 mm. long; pistillate flowers 2–3 at a locus, 2–3 mm. long, hypanthium to 1 mm. long, puberulent, perianth lobes orbicular 1–1.5 mm. long and wide, puberulent outside; stamens rudimentary, 0.5–1 mm. long, sterile; pistil glabrous or rarely slightly puberulent 1–2 mm. long, slightly 3-angled, style glabrous, 1–1.5 mm. long, stigmas flattened or slightly bilobed; fruit globose to ovoid, 5–6 mm. long and 4–5 mm. in diameter, fruiting perianth imbricate at apex, not turbinate, hypan-



thium with conspicuous vascular bundles, achene sub-globose, dark brown, shining, slightly tri-radiate at the apex, fruiting pedicels puberulent, 3–4 mm. long.

DISTRIBUTION: Hispaniola, Puerto Rico, Barbuda, Antigua, Montserrat, Nevis, Guadeloupe, Dominica, Martinique, St. Lucia.

Puerto Rico: Guajataca, *Sargent B-1* (US); La Chiquita near Maricao, *Britton & Cowell 4272* (F, NY, US); Maricao Insular forest, *Howard 12600* (G); Maricao, *Stevens & Hess 3715* (NY); Utuado, *Britton & Cowell 981* (NY, US). *Sintenis 5925* (GH, US). COMMON NAME: "Moralon."

*Coccoloba pubescens* was described by Linnaeus in his *Systema* in 1759 at which time he cited a Plukenet illustration and description. Unfortunately the Plukenet illustration is poor and does not match any of the material I have cited as to leaf shape or the relative length of the petiole. In fact, the illustration shows a leafy branch arising from an ochrea in the position of a petiole or leaf. Fawcett and Rendle (*Jour. Bot.* 51: 123. 1913) reported there was no specimen of this species in the Linnaean Herbarium but that the Plukenet specimen was preserved in the Sloane Herbarium at the British Museum. An examination of this specimen showed it consisted of a terminal and juvenile leaf and bore little relationship either to the drawing of the plant as seen in the field or to the herbarium specimens cited above.

The specific location from which the type specimen originated was presumably Barbados. I have seen and collected the species on islands from St. Lucia to Hispaniola. *Coccoloba pubescens* is also reported from Mexico, Guiana and Brazil, but I have not seen specimens from these areas. Patrick Browne described a plant from Jamaica which was referred to this species by Fawcett & Rendle. Recent collectors have failed to locate the species in the area mentioned by Browne and it must be concluded that Browne's reference applies to adventitious leaves of *Cordia sebestena* (see Howard, *Jour. Arnold Arb.* 38: 105. 1957).

A study of a great number of colonies in the West Indies has indicated that there is a tremendous range of variation in single plants and in colonies of this species. *Coccoloba pubescens* is generally found in drier areas commonly on the windward slopes and generally near the seacoast. The large leaves of the plants appear to be unaffected by salt spray. It has also been found in the mountains and occasionally in more moist wooded areas. Specimens planted in the Maricao National Forest in Puerto Rico, an area of very moist environment, apparently are doing well.

In general appearance in the field, *Coccoloba pubescens* is a conspicuous plant. The habit is wand-like, unbranched except near the top and bearing extremely large leaves. A plant 20 feet tall may be only 1–2 inches in diameter at breast height. These invariably are young saplings of adventitious shoots which are produced when the original trunk is felled. John Beard's illustration of *Coccoloba pubescens* in St. Lucia (as *C. grandifolia* in *The Natural Vegetation of the Windward and Leeward Islands*,



f. 32, 1949) is a good example of such a stand of young trees and adventitious shoots. The wood of even young plants is hard and is valued for charcoal. These plants are cut frequently, which prevents many stands from reaching maturity. Most descriptions of this species have been compiled from a study of herbarium specimens of these young plants or of adventitious shoots.

The only undisturbed mature trees I have seen in the islands from St. Lucia to Jamaica were found in remote and undisturbed areas of Hispaniola. Thus the description given here, while at variance with most published descriptions, is based on a field knowledge of this species and exemplified by personal collections (*Howard* 12143 and 12352) from above Puerto Escondido and from Beata Island in the Dominican Republic. Several of Ekman's collections from within Barahona peninsula agree with this description; e.g., *Ekman* H-6947.

A real problem is encountered in compiling a description of this species. Herbarium material cited in general represents adventitious shoots or young plants. These abnormal specimens with large leaves represent the plant as commonly seen in the field. I now know that the plants may remain in the juvenile leaf condition for as long as twenty-five years. One such specimen is in a fence row of known age in the Dominican Republic. Only one terminal branch of the tree developed the smaller leaves characteristic of the fully mature plant.

*Coccoloba pubescens* will produce flowers and fruit while bearing juvenile leaves. The inflorescences of such plants may reach 45 cm. (*Howard* 11863) in length and Eggers reports one specimen with a raceme 65 cm. long. This is in contrast to a raceme of 15–18 cm. in a fully mature branch. The flowering or fruiting herbarium specimens will show all the range of size from the largest leaves ( $50 \times 80$  cm.) to that reported for fully mature leaves  $4 \times 6$  cm. or  $7.5 \times 10$  cm. (*Howard* 12143). It is difficult to visualize this range of variation unless one has seen it in the field.

The development and amount of pubescence is likewise a variable character. Observations made in the field indicate that the amount of pubescence may be a matter of individual plant variation in a colony. Generally the immature leaves are pubescent and become glabrous except on the veins. However, some large thin young leaves of adventitious shoots were found to be glabrous, while older leaves on the same shoot were pubescent. Generally the leaves of the adventitious shoots bore more pubescence than those of older shoots. Britton and Wilson in describing this species for Puerto Rico and the Virgin Islands offer a complete description that in some aspects appears to be original. It is certainly not taken directly from Lindau's monograph, nor can I find any similarity in the descriptions of more recent students of the West Indies. However, Britton and Wilson's description is not supported by herbarium material of fertile plants. There are in the herbarium of the New York Botanical Gardens two photographs mounted on herbarium sheets, one of a woman holding the large leaf from an adventitious shoot of this plant and



one of a thicket composed of this plant, all of which bear large leaves. It appears to me that Britton must have seen mature plants in the field, although herbarium records and many portions of his published description indicate a knowledge of the large-leaved adventitious shoots only.

I saw many areas on the south coast of Puerto Rico where single or few plants of *Coccoloba pubescens* were present. I did not see a single mature tree with the smaller leaves and the inflorescences and fruit of the older plant. Plants with adventitious shoots and leaves comparable to those photographed and described by Britton (e.g. 1 m. in diameter) were seen only in plantings of this tree in the Maricao National Forest in regions of higher rainfall.

Britton and Wilson report this to be a tree "to 25 m. high," the racemes "densely many-flowered, 4-7 dm. long," characteristics which do not agree with specimens I have seen in the field. The remainder of Britton's description of the vegetative portions applies to the exaggerated, abnormal individual in adventitious shoot condition.

In the second edition of *Species Plantarum* the species name of this binomial was misprinted as *Coccoloba rubescens*.

The epithet *Coccoloba grandifolia* Jacq. published in 1760 is a synonym of *C. pubescens* L. Britton and Wilson and a few other recent authors have accepted Jacquin's name, apparently overlooking the earlier valid publication of *C. pubescens* by Linnaeus.

In 1940 Sandwith described a new species under the name *Coccolobis antiguensis* based on collections by Box 1496 and 301. This species was suggested as allied to *C. pubescens* but differed in the aspect of the leaf. It was further suggested that *C. antiguensis* might represent a hybrid between *C. uvifera* and *C. pubescens*. In 1950 I searched the area around Carr's Gut for the single tree from which Box made the two collections cited by Sandwith. Unfortunately, the tree could not be located and may no longer exist, as the area was heavily cultivated and drastically cut over. In the specimens cited above, all the characters given for *C. antiguensis* can be found. The collection Box 301 is definitely taken from an adventitious shoot. The U. S. National Herbarium specimen of this number (US 1535774) is the typical rhombic terminal leaf of adventitious shoots of *C. pubescens*. Box 1496 is a fertile collection; however the tortuous stems, the pubescence and the flat blades can be found in many other specimens. *Coccoloba antiguensis* is known only from pistillate material. A collection by John Beard and one of my own from the Wallings area of Antigua show the same plane leaves with the veins slight on the lower leaf surface. Beard 283 can be considered a match for Box 1496 in the foliage. Beard's collection is in fruit and the fruits are typical of *C. pubescens*.

*Coccoloba uvifera* L. Syst. Nat. ed. 10, 1007. 1759; Lindau, Engl. Bot. Jahrb. 13: 204. 1890, Symb. Antill. 1: 231. 1899; Fawcett & Rendle, Fl. Jam. 3: 119. 1914.

*Polygonum uvifera* L. Sp. Pl. 365. 1753.



*Guaibara uvifera* (L) House, Am. Midl. Nat. 8: 64. 1922.

*Coccolobis uvifera* Brit. & Wils., Sci. Surv. P.R. 5: 268. 1924.

Tree of strand areas, 2–15 m. tall; branches terete, stout, papillose to pilose, the nodes not tumid; ochreae rigid, coriaceous at the base, membranaceous at the apex, 3–8 mm. long, puberulent to pilose; petioles stout, 7–10 mm. long, papillose to pilose; leaf blades orbicular to reniform, 6 × 8, 11 × 13, 13 × 18 cm. long and broad, thick and fleshy when fresh, coriaceous when dry, glabrous and minutely punctate on both surfaces, the midrib and primary veins prominent on both surfaces, frequently brightly colored when fresh, the primary veins 3–5 pairs, usually straight, bifurcate and weakly anastomosing near the margin, commonly barbate in the axils of the basal veins, secondary venation minutely reticulate or obscure; apex rounded, truncate or emarginate, the base rounded to broadly cordate, one lobe often extended around the petiole; leaves of adventitious or fast-growing shoots usually variable in size and shape, but commonly obovate; inflorescence stout, 15–13 cm. long, rachis puberulent; staminate flowers in clusters of 1–7, the pistillate flowers solitary, the bracts ovate, 1–1.5 mm. long, 2 mm. broad, puberulent, the ochreolae membranaceous, 1 mm. long, puberulent, the flowering pedicels 1–2 mm. long, the perianth yellow-white or greenish, the hypanthium 2–3 mm. long, the perianth lobes 4 mm. long, 3–4 mm. wide, the fertile stamens to 4 mm. long; fruiting pedicels 3–4 mm. long, the fruit obpyriform, 1.2–2 cm. long, 8–10 mm. in diameter, narrowed at the base, rounded-truncate at the apex, the perianth lobes appressed against the apex of the achene, perianth rose-purple when mature, the achene black.

**DISTRIBUTION:** General along beaches of Florida, Bermuda, the Bahamas through the Caribbean area to South America.

**Puerto Rico:** Cataño, *Millspaugh* 178 (F, NY); Condado, *Britton, Britton & Brown* 7065 (NY); Fajando, *Evermann* 1243 (US), 1245 (US), *Heller* 1013 (US); Mayaguez to Guanajubo, *Sintenis* 765 (GH, US); Ponce, *Sargent* 568 (US); San Juan, *Rose* 21607 (US), *Sintenis* 765b (US); Santurce, *Stevenson* 343 (US), *Heller* 1392 (F, NY); Yauco, *Underwood & Griggs* 719 (F, NY, US). **Culebra Island:** *Millspaugh* 1786 (F). **Mona Island:** *Stevens* 6339 (NY). **Vieques Island:** *Morrow* 143 (US), *Shafer* 2586 (NY, US). **Anagada:** *Britton & Fredloch* 970 (NY, US). **St. Croix:** *James* 8 (GH), *Ricksecker* 17 (F, MO, NY), *Mrs. J. J. Ricksecker* 108 (F, MO). **St. Thomas:** *Eggers* 216 (GH), 328 (B), *Hjalmarsson* 17 (S); *Kuntze* 5586 (NY). **Virgin Gorda:** *Fishlock* 333 (NY).

***Coccoloba diversifolia* Jacq. Enum. Pl. 19. 1760, Hist. Stirp. Amer. 114, pl. 76. 1763; Howard, Jour. Arnold Arb. 30: 421. 1949.**

*Coccoloba laurifolia* Lindau, Engl. Bot. Jahrb. 13: 158. 1890; Urban, Symb. Antill. 1: 227. 1899; Fawcett & Rendle, Flora Jam. 3: 116. 1914 and all recent authors, not Jacquin.

*Coccolobis laurifolia* Brit. & Wils., Sci. Surv. P.R. 5: 268. 1928, not Jacq.

*Coccoloba longifolia* Schmidt, Fedde Rep. Sp. Nov. 24: 73. 1927, not Fischer.

*Guaibara laurifolia* House, Am. Midl. Nat. 8: 64. 1922 (as *Guaibara*).



Shrub or small tree to 7 m. tall; branches terete, often geniculate by limited growth, glabrous, the nodes rarely slightly tumid; ochreae coriaceous in the persistent lower portion, membranaceous and deciduous above, 3–5 mm. long; petioles 7–10 mm. long, glabrous, leaf blades ovate, oblong, elliptic, lanceolate or obovate, variable on a single shoot, the apex rounded, obtuse, acute or acuminate, the base cuneate to rounded or subcordate,  $4 \times 3.5$ ,  $7 \times 5.5$ ,  $8 \times 4.5$ ,  $12 \times 8$  cm. long and wide, coriaceous, often shining above, dull beneath, glabrous, the midrib and primary veins slightly prominent above, the secondary venation reticulate on both surfaces, the primary veins 3–7 pairs, arcuate, anastomosing before reaching the margin, the margin entire, commonly slightly recurved; leaves of adventitious shoots similar in shape to those of normal growth but larger in size,  $17 \times 8$ ,  $24 \times 13$ ,  $32 \times 12.5$  cm. long and wide on petioles 1–2.5 cm. long; leaves of windswept specimens often much smaller than those of normal shoots,  $2 \times 1.3$ ,  $3 \times 2$  cm. long and wide; inflorescence terminal 4.9, 9, 11 to 18 cm. long; rachis glabrous; staminate flowers in clusters of 2–5, the pistillate flowers solitary; bracts ovate, less than 0.5 mm. long, 1 mm. broad, glabrous; ochreolae membranaceous, less than 0.5 mm. long, glabrous, the flowering pedicels 2–4 mm. long, glabrous; hypanthium 1 mm. long, the perianth lobes  $2 \times 2$ , to  $3 \times 1$  mm. long and broad, filaments of functional stamens 1 mm. long, fruiting pedicels 3–4.5 mm. long; fruit globose to obpyriform  $10 \times 7$ ,  $12 \times 8$ ,  $13 \times 8$  cm. long and thick, perianth lobes appressed at the apex of the achene.

DISTRIBUTION: Florida and the Bahamas, through the West Indies to South America.

**Puerto Rico:** Bayamon, *Britton & Britton* 7944 (NY), *Heller* 400 (F, NY, US), 4687 (F, GH, MO, NY, US), *Johnston* 904 (US); Cabo Rojo, *Sintenis* 714 (GH, S, US), 771 (MO, US), *Howard* 12604 (GH), 12605 (GH); Coamo Springs, *Britton, Britton & Marble* 2232 (NY, US), *Britton, Britton & Brown* 5904 (FM, NY); Guanica, *Sintenis* 3507 (FM, NY); Luquillo Mts., *Holdridge* 522 (NY); Guayanilla, *Britton & Shafer* 1812 (NY, US); Martin Peña, *Stevenson* 1234 (US), 1859 (NY); Ponce, *Heller* 6189 (A, F, GH, MO, NY, US); Ponce to Penuelas, *Britton & Cowell* 1309 (NY, US); Quebradellas, *Stevens* 1720 (NY); Sardinera to Ubero, *Britton, Cowell & Hess* 1774 (NY, US); San German, *Sargent* 446 (US); San Juan, *Gerhart & Holdridge* 525 (NY); Santurce, *Heller* 1301 (F, NY, US); Yauco, *Gardner s.n.* (NY). **Mona Island:** *Stevens* 6312 (NY), 6379 (NY), 6380 (NY), 6436 (NY). **Vieques Island:** *Shafer* 2795 (NY, US). **St. Croix:** Kingshill, *Eggers s.n.* (US).

The proper application of the names *Coccoloba laurifolia* Jacq. and *C. diversifolia* Jacq. was discussed in the first paper of this series in the *Journal of the Arnold Arboretum* 30: 421. 1949.

*Coccoloba sintenisii* Urb. ex Lindau, *Engl. Bot. Jahrb.* 13: 157. 1890.

*Coccolobis sintenisii* Britton & Wilson, *Sci. Surv. P.R.* 5: 268. 1924.

Tree 20–30 ft. tall, diameter at breast height 4–12 inches, bark rough, scaly, gray; branches glabrous, lenticels linear; ochreae glabrous, mem-



branaceous and deciduous above, the basal portion coriaceous, persistent, extending 3–4 mm. above the attachment on the adaxial side of the petiole but to 1 mm. on the opposite side, petiole inserted on a conspicuous base, 6 mm. long above the base of the ochreae, petiole 2–4 cm. long, stout, i.e. 5 mm. diameter, its thickness diminishing rapidly in the blade, glabrous; mature leaf blade oval to oblong,  $9 \times 12$ ,  $10 \times 16$ ,  $13 \times 16$ , to  $14 \times 19.5$  cm. long and broad, thick coriaceous, entire, glabrous on both surfaces, the apex obtusely acuminate to obtuse, often almost apiculate, the base unequally cordate, the midrib and primary veins conspicuous below, primary veins immersed or both primary veins and midrib evident above, the ultimate venation inconspicuous on both surfaces; leaves of adventitious shoots to  $18 \times 24$  cm. long and broad on petioles to 5 cm. long; inflorescences generally terminal on lateral shoots, rarely lateral or terminal on main shoots, 5–15 cm. long, the rachises, pedicels and flowers brightly colored, crimson when fresh and purplish red when dry, basal ochreae membranaceous and deciduous or slightly coriaceous at the base, this portion persistent to 6 mm. long and slightly puberulent, the rachis thick, occasionally flattened, usually striate, glabrous, bracts broadly ovate, less than 0.5 mm. long, ochreolae less than 0.5 mm. long, flowering pedicels 4–5.5 mm. long, glabrous; staminate flowers with hypanthium 1–2 mm. long, the perianth lobes  $2-2.5 \times 1.5-2$  mm. long and broad, the stamens with filaments united at the base to 1 mm., the free portion 1.5–2 mm. long, the pistil rudimentary 1–1.5 mm. long; pistillate flowers borne singly, the perianth lobes 1.5 mm. long, 1–1.3 mm. wide, the rudimentary stamens 8–10, the filaments dilated and united at the base, less than 1 mm. long, the pistil obconical, the ovary 1.5–2 mm. long, the styles 3, equal, 1–1.5 mm. long, the fruiting inflorescences 10–20 cm. long, stout at the base, tapering rapidly, the pedicels in fruit 5–6 mm. long; fruit ovoid, very slightly pedunculate, 4–5 mm. in diameter, the perianth lobes persistent, generally appressed but free, to 3 mm. long, the achene circular in transverse section, the hypanthium not evidently vascularized.

DISTRIBUTION: Endemic to Puerto Rico.

**Puerto Rico:** Coamo Springs, *Britton & Britton 10052* (NY), *Britton, Britton & Brown 6038* (NY); CCC Camp Susua, *Velez 1120* (NY); Maricao, *Sintenis 223* (B — TYPE), *Sargent 393* (US); Maricao National Forest, *Howard 12603* (GH); Rio de Maricao, *Britton, Stevens & Hess 2430* (NY, US), *Britton & Cowell 4218* (F, NY, US); Sabana Grande, *Sargent 620* (US).

*Coccoloba sintenisii* is clearly a distinct species characterized by the long pedicels in both flowering and fruiting condition and by the bright red color of the inflorescence.

Britton applied an herbarium name to the specimens from Coamo Springs. A description had been compiled and was found among Dr. Britton's unpublished manuscripts. Other than the reduced brilliance of color in the inflorescence, I can see no significant difference in these specimens from the type or from the specimens cited above. The material from



Coamo Springs can be included within the definition of *C. sintenisii*. Staminate and pistillate flowers are borne singly in all specimens I have seen, although only one staminate specimen is known.

**Coccoloba costata** Wr. ex Sauvalle, Fl. Cub. 139. 1868; Lindau, Engl. Bot. Jahrb. 13: 155. 1890, Symb. Antill. 1: 225. 1899; Schmidt, Fedde Repert. Sp. Nov. 27: 105. 1929; Howard, Jour. Arnold Arb. 30: 145. 1949.

*Coccolobis costata* Brit. & Wils., Sci. Surv. P.R. 5: 270. 1924.

*Coccoloba verruculosa* Lindau, Engl. Bot. Jahrb. 13: 154. 1890.

*Coccoloba rupicola* Urb., Symb. Antill. 6: 10. 1909; Brit. & Wils., Sci. Surv. P.R. 5: 270. 1924, as *Coccolobis*.

*Coccoloba helwigii* Schmidt, Fedde Repert. Sp. Nov. 27: 104. 1929.

*Coccoloba samuelssonii* Ekm. & Schmidt, Fedde Repert. Sp. Nov. 27: 105. 1929.

*Coccoloba* sp. Urban, Symb. Antill. 4: 656. 1911.

Small tree of shrubby growth or tree to 10 m. tall; branches stout with a ferrugineous to golden pubescence this often persisting only in protected spots or at the apex; ochreae membranaceous 4–6 mm. long, ferrugineous puberulent to sub-glabrous; leaf blades generally ovate to elliptic, less commonly suborbicular to obovate-orbicular, the apex obtuse or rounded, the base generally slightly and unequally cordated to narrowly unequally decurrent on the petiole,  $2.5 \times 2.5$ ,  $5 \times 5$ ,  $7 \times 5$ ,  $11 \times 8$  to  $18 \times 12$  cm. long and broad, coriaceous, golden shining above, dull brown below, midrib and veins impressed above, prominent below, the primary veins 5–7 pairs, arcuate, anastomosing, the blades sparsely pitted above and below, often showing anomalous peltate or variously shaped resinous stomatal secretions below, these abundant when leaf is young and scattered and few in mature leaves, otherwise glabrous; petioles stout, 8–10 mm. long, slightly puberulent; leaves of adventitious shoots to  $35 \times 22$  cm. long and broad on petioles to 1.5 cm. long; inflorescence terminal, rachis puberulent, 15–20 cm. long, the staminate flowers in clusters of 2–4, the pistillate flowers solitary, the bracts ovate, 0.5 mm. long, the ochreolae membranaceous, 0.5 mm. long, the flowering pedicels 0.5 mm. long, the hypanthium 0.5 mm. long, the perianth lobes 0.5–1 mm. long and broad, the fertile stamens 1 mm. long; fruiting pedicels to 1.5 mm. long, the fruit globose, to 6 mm. long, 3 mm. thick, the perianth lobes coronate.

DISTRIBUTION: Cuba, Hispaniola, Puerto Rico.

**Puerto Rico:** Aybonito, *Sintenis* 5934 (GH); Utado at Los Angeles, *Sintenis* 5994 (B — TYPE of *C. rupicola*, GH, NY, US); Larez, *Winters* s.n. (A).

The previous treatment considering *Coccoloba costata* which I published was without the benefit of field study of its related species, *C. samuelssonii*, *C. helwigii* and *C. verruculosa* in Hispaniola and *C. rupicola* of Puerto Rico. Following an examination and study of numerous stands of all but the last of these species in the field, I can only conclude that they represent



ances, at most, of a single species. As *Coccoloba costata* is the oldest name available, I am referring five species or previously recognized taxa found in Hispaniola and Puerto Rico to *C. costata* and am extending the range of this group to the Greater Antilles, excluding Jamaica.

*Coccoloba costata* has been considered for many years an endemic species of Cuba. In 1929 Schmidt referred a single Ekman collection from Haiti to this species at the same time he described *C. samuelssonii* and *C. helwigii*. Only two subsequent collections by Ekman have been so annotated. Schmidt compared *C. costata* with his new *C. samuelssonii* and differentiated between them on the shape of the leaf base and the texture and shine of the leaf surface. These are extremely weak characters in the genus *Coccoloba*, holding true only if the actual type specimens of each species were considered. The variation in *Coccoloba samuelssonii* as represented by Schmidt's determinations of Ekman collections and my own observations in the field are tremendous.

*Coccoloba helwigii* described by Schmidt was based on *Ekman* 8523, cited as the type, and *Ekman* 4944. Schmidt characterized this new species as having generally suborbicular leaves which are minutely punctate below. On the basis of these two characteristics Schmidt compared it with *C. leoganensis* (his *C. rotundifolia*) and *C. buchii*. The leaf shape is matched in other Ekman specimens such as *Ekman* 4684, referred by Schmidt to *C. costata* forma, *Ekman* 2855, referred to *C. costata*, and *Ekman* 8721, referred to *C. samuelssonii*. As all of these collections show variations on single sheets from leaves suborbicular in shape to leaves ovate-orbicular or even broadly ovate, it is felt that the smaller leaves of the type specimens of *C. helwigii* represent the smaller end of the range of variation in leaf size.

The minute punctations seen and mentioned by Schmidt are excretions from the stomata of the leaf. The chemical nature of the substance has not been determined. However, the material dries into peltate, appressed or stalked artifacts which can be lifted free from the stomata and the leaf with a needle. Similar excretions are found in other specimens of *C. costata* which I have seen, but are more distinctly developed in the Hispaniolan specimens than in the Cuban and Puerto Rican material. The original collections cited for *C. helwigii* are unique in having the excretions in every stomatal opening which gives the entire lower leaf surface the aspect of being dotted in dark brown color. This condition, however, seems characteristic of younger leaves, for some of the older and larger leaves on the type sheet of *C. helwigii* are glabrous or lack these artifacts. The same type of excretion is found on the type specimens of the four species cited here in synonymy.

Lindau described *Coccoloba verruculosa*, basing the species on *Eggers* 1762 from Hispaniola and *Sintenis* 5994 from Puerto Rico. The original description is next to that of *C. costata* in his species order. Using Lindau's key, these two species fall into groups separated by the length of the flowering pedicel. However, the key distinction is not borne out in the



species descriptions. From the published descriptions (Engl. Bot. Jahrb. 13: 154–155. 1890), the major differences cited are those of pubescence and number and length of pedicels. Lindau overlooked the pubescence which is present on *Eggers 1762* and *Sintenis 5994* and which is comparable to that of *C. costata*. The difference in number and length of the flowering pedicels is a sexual character not recognized by Lindau or Schmidt. *Coccoloba verruculosa* is based on a staminate plant and *C. costata* on a pistillate specimen (*Wright 1393*). *Coccoloba verruculosa* is clearly the same as *C. costata*.

The Sintenis collection 5994 from Puerto Rico has had a turbulent history. Lindau cited it in the original description of *C. verruculosa* although the specimen is poor, being only an old and staminate inflorescence axis. In spite of the condition of the specimen, Urban selected several minor and variable characteristics in the length of the petiole, the shape of the leaf base and the nature of the leaf surface and described *C. rupicola*, citing *Sintenis 5994* as the type and only collection. Britton and Wilson had a fragment of the same sterile material and were only able to append the species to their key to the genus as "species not grouped, known from foliage only." However, in their discussion they state that "Lindau erroneously regarded it as the same as *C. verruculosa* Lindau of Hispaniola." *Coccoloba verruculosa* does not differ from *C. costata* in any significant manner and must be included in the latter species.

A second Sintenis collection from Puerto Rico from Aybonito between Algarrobo and Caribbeanos, *Sintenis 5934*, was included in *Coccoloba costata* by Lindau. This material consists of faster growing shoots and is sterile. Urban (Symb. Ant. 4: 656. 1911) felt it represented some other species and Britton and Wilson repeated the suggestion but cited the collection under *C. costata*, appending it to the list of known species.

The two Sintenis collections 5934 and 5994 were until recently the only material of this species known from Puerto Rico. Britton and his colleagues collected intensively in Puerto Rico but failed to find material which could be referred here. Recently Mr. Harold Winters sent me material which he had collected in July 1956 from the limestone hills north of Larez in Puerto Rico. This collection was of ample material with mature fruit and displayed a considerable range of leaf variation. In all characteristics this recent material substantiates the earlier conclusion of the proper association of the Puerto Rican and Hispaniolan species with *C. costata* of Cuba.

#### COCCOLOBA IN THE BAHAMA ISLANDS

In their publication *The Bahama Flora* (New Era Printing Company, 1920), Britton and Millspaugh present a key to the genus *Coccoloba*, recognizing six species in the flora, one of which they described as new. Recent collections have failed to add to this number. Several changes of names are required for the species and the generic description used in *The Bahama Flora* should be altered to recognize the dioecious, rarely monoe-



cious plants having flowers that are functionally unisexual. The staminate flowers are usually in clusters of 2–5 at each node of the inflorescence axis, while the pistillate flowers are borne singly. The key to the species, however, needs little change.

With the resurgence of interest in the Bahama Islands, both by tourists and botanists, it is hoped that additional collections of the vegetation can be made. Some of the gaps in the distribution of the species cited in this paper are probably nothing more than a lack of collections.

In general, the specimens of all species of *Coccoloba* seen in and from the Bahamas are smaller in size than representatives of the same species from other and adjacent islands of the West Indies. The reduction in size seems complete, from the stature of the plants to the size of the leaves on both normal and adventitious shoots, and is evidenced, as well, in the flowers and fruits. This reduction in size is particularly evident in collections referred to *Coccoloba swartzii*. The xerophytic conditions of the islands in the Bahamas, coupled with the inhospitable substrata of limestone, coral and sand, may naturally stunt the species. It is hoped that some fruits of *C. uvifera*, *C. diversifolia*, *C. swartzii*, *C. tenuifolia* and *C. krugii* which have been sent to several of the Bahama Islands from Jamaica, Cuba and the Dominican Republic may grow and, in a few years, allow comparison with voucher specimens of the parent trees on file in the herbaria of the Arnold Arboretum and the Gray Herbarium.

#### KEY TO THE SPECIES IN THE BAHAMAS

Flowering and fruiting pedicels 1 mm. or more long, exceeding the ochreolae.

Leaves very large, suborbicular, generally broader than long, 7–20 cm. wide.  
..... *C. uvifera*.

Leaves ovate to elliptic, obovate or orbicular, longer than broad.

Primary veins arcuate, anastomosing near the margin.

Leaves coriaceous; racemes stiff erect or spreading; fruit 7–14 mm. long.  
..... *C. diversifolia*.

Leaves chartaceous; racemes thin, long and drooping; fruit about 4–6 mm. long.  
..... *C. tenuifolia*.

Primary veins free to the margin of the leaves. .... *C. northropiae*.

Flowering and fruiting pedicels less than 1 mm. long and not exceeding the ochreolae.

Inflorescence longer than the leaves; leaves reticulate veined on both surfaces when dry, turning dark brown or black; fruit dark brown, round in cross section. .... *C. swartzii*.

Inflorescence shorter than the leaves; ultimate leaf venation inconspicuous above, evident below, leaves drying pale tan or green, petioles often buff-colored; fruit reddish brown, distinctly triangular in section. .... *C. krugii*.

***Coccoloba uvifera*** L. Syst. Nat. ed. 10, 1007. 1759.

*Coccolobis uvifera* Britton & Millspaugh, Bahama Flora 116. 1920.

**Abaco:** *Brace* 1476 (NY). **Acklin's Island:** *Brace* 4514 (F). **Andros:** *A. E.*



*Wright* 269 (F, GH). *Anguilla*: *Wilson* 7960 (F). *Crooked Island*: *Brace* 4681 (F). *Inagua*: *Harshberger* 16 (US), *Nash & Taylor* 1028 (NY), 1055 (F, US), 1226 (NY). *New Providence*: *Dewey* 561 (US), *C. F. Millspaugh* 2101 (F), *Northrop* 80 (A, F, GH). *North Bimini*: *Howard* 10188 (A), 10201 (A), 10216 (A). *Silver Cay*: *Millspaugh* 2455 (F). *Turks Island*: *Nash & Taylor* 3772 (F, US). *Watling's Island*: *Hitchcock s.n.* (F).

A description of the species and complete synonymy is given earlier in this paper. Britton and Millspaugh refer *Coccolobis leoganensis* Jacq. to synonymy here. This is now regarded as a distinct and endemic species of Hispaniola.

### *Coccoloba diversifolia* Jacq. Enum. Pl. 19. 1760.

*Coccolobis laurifolia* Britton & Millspaugh, The Bahama Flora 117. 1920.

*Coccolobis tenuifolia* Northrop, Mem. Torrey Bot. Club 12: 34. 1902, not L.

*Coccolobis wrightii* Northrop, Mem. Torrey Bot. Club 12: 34. 1902, not Lindau.

**Abaco**: Great Cistern, *Brace* 1679 (NY); Old Kerr's Point, *Brace* 2012 (FM). **Acklins Island**: *Brace* 4453 (FM, NY). **Andros**: Deep Creek, *J. I. & A. R. Northrop* 721 (FM, G, NY); Long Bay Cay, *Small & Carter* 8584 (FM, G, NY, US); Crow Hill, Bay Cay, *Small & Carter* 8717 (FM, G, NY, US); Mangrove Cay, *Small & Carter* 8491 (FM, G, NY, US); Nicols Town, *J. I. & A. R. Northrop* 443 (A, G, FM, NY); Calabash Bay, *A. E. Wright* 266 (FM, G, NY); Mangrove Cay, *Brace* 4937 (FM, NY). **Berry Island**: Great Stirrup Cay, *Britton & Millspaugh* 2271 (FM, NY, US). **Cat Island**: *Wilson* 7174 (FM, NY). **Crooked Island**: Landrail Point, *Brace* 4571 (NY, FM), *Hitchcock s.n.* (MO). **Exuma**: Harvest Cay, *Wilson* 7889 (FM, G, NY); Georgetown, *Britton & Millspaugh* 3121 (FM, NY, US), *Britton & Millspaugh* 2776 (FM, NY). **Eleuthera**: Harbour Island, *E. G. Britton* 6382 (FM, NY, US), *J. T. Rothrock* 570 (FM). **Great Ragged Island**: Hog Cay, *Wilson* 7873 (FM, G, MO, NY). **Great Bahama**: *Britton & Millspaugh* 2602 (FM, NY, US). **Green Cay**: *Coker* 238 (NY). **Fortune Island**: *Eggers* 3850 (A, G, US), 3996 (G), *Hitchcock s.n.* (MO). **Inagua**: *Hitchcock s.n.* (FM, MO), *Nash & Taylor* 1056 (FM, NY); Mathewtown, *Nash & Taylor* 880 (FM, NY), 1452 (NY); Balsam Hill, *Nash & Taylor* 1270 (FM, NY). **Little San Salvador**: *Britton & Millspaugh* 5687 (FM, NY). **Long Cay**: *Brace* 4045 (FM, NY). **New Providence**: Hog Island, *Wilson* 8307 (FM, NY), 8315 (FM, NY), *Britton & Brace* 353 (FM, G, NY); Nassau, *Ames s.n.* (A), *Britton* 76 (NY), 86 (NY); Grantstown, *Wilson* 8182 (FM, NY), 8176 (FM, NY); West End Bight, *Millspaugh* 2292 (FM, NY); West Bay St. Road, *Millspaugh* 2164 (FM), 2195 (FM), 2159 (FM), *Hitchcock s.n.* (FM, MO), *Britton & Britton* 115 (NY), *Degener* 18971 (A), 18972 (A, MO), 18973 (A), *Britton & Brace* 476 (F, NY). **North Caicos**: *Wilson* 7709 (F, GH, NY), *Proctor* 9043 (A), 9076 (A). **Rose Island**: *Wilson* 7902 (F, GH, NY), *Britton & Millspaugh* 2128 (F, NY), 2124 (F, NY, US). **South Cat Cay**: *Millspaugh* 2431 (F, NY), 2434 (F, NY). **South Bimini**: *Millspaugh* 2379 (F, NY), 2382 (F, NY), *R. A. & E. S. Howard* 10039 (A), 10040 (A), 10041 (A), 10238 (A), 10247 (A), 10252 (A), 10253 (A). **Watling's Island**: *Wilson* 7249 (F, GH, NY).

A full description of the species and the synonymy were given earlier in this paper.



**Coccoloba tenuifolia** L. Syst. Nat. ed. 10, 1007. 1759, Amoen. 5: 397. 1760, Sp. Pl. ed. 2, 524. 1762; Fawcett & Rendle, Flora Jam. 3: 119, 1914, Jour. Bot. 51: 124. 1913; Howard, Jour. Arnold Arb. 30: 407. 1949, 38: 93. 1957.

*Coccoloba leptostachyoides* Lindau, Engl. Bot. Jahrb. 13: 207. 1890.

*Coccolobis* ? *frutescens*, *foliis subrotundis*, *fructu minore trigone* Brown, Hist. Jam. 210, t. 14, f. 3. 1756.

*Coccoloba excoriata* L. Syst. Nat. ed. 10, 1007. 1759; Fawcett & Rendle, Flora Jam. 3: 121. 1914.

*Coccolobis bahamensis* Britton, Bull. N.Y. Bot. Gard. 4: 116. 1905; Britton & Millspaugh, The Bahama Flora 117. 1920.

*Coccolobis obtusifolia* Northrop, Mem. Torrey Bot. Club 12: 34. 1902, not Jacq.

Shrub, rarely a small tree 6 to 15 feet tall; branches terete, light brown in color, glabrous or puberulent; ochreae membranaceous above and deciduous, coriaceous and persistent below, puberulent; the leaves characteristically borne on lateral shoots and crowded, the petioles short persistently puberulent, 6–9 mm. long, arising from a conspicuous base above the base of the ochreae, the blades generally elliptic, occasionally obovate, ovate, oblong or sub lanceolate,  $3.5 \times 2$ ,  $7 \times 4.5$ ,  $8 \times 6$ ,  $9.5 \times 6$  to  $12 \times 10$  cm. long and broad, membranaceous to subcoriaceous, the apex acute, short acuminate or rarely obtuse, the base narrowed and unequally rounded to subcordate, the margin entire to undulate, the blade often conspicuously umbonate in the field; midrib and veins flat or impressed above, prominent beneath, primary veins 4–6 pairs, arcuate, the ultimate venations finely reticulate, glabrous above, finely puberulent below, generally tomentose in the axils of the veins and extending on to the lamina persisting or evident as clear hair bases; adventitious shoots with leaves evenly distributed, petioles 2–5 cm. long, the blades  $7 \times 9$  to  $18 \times 16$  cm. long and broad; inflorescence terminal from the lateral leafy shoots, to 8 cm. long, weak and hanging generally strongly curved, the rachis puberulent becoming glabrate; staminate flowers 1–4 at the node, the pistillate flowers usually solitary, the bracts broadly ovate, to 0.5 mm. long, the ochreolae membranaceous, 0.5 mm. long, the pedicels 1 mm. long, the hypanthium 1–1.5 mm. long with apparent basal stalk more conspicuous in the pistillate flower, the perianth lobes 1–1.5 mm. long and broad, the functional stamens 1–1.5 mm. long, the functional pistil 1.5 mm. long; fruiting pedicels 1–1.5 mm. long, the fruit ovoid 5–6 mm. long and 4 mm. in diameter with a short stalk 0.5 mm. long, the perianth lobes appressed, the achene tan in color.

DISTRIBUTION: Bahamas, Cuba and Jamaica.

**Andros:** Mangrove Cay, *Small & Carter* 8513 (FM, NY), 8525 (FM, K, NY, US), 8537 (FM, NY), 8509 (FM, NY, K, US), 8511 (FM, K, NY, US); Deep Creek, *J. I. & A. R. Northrop* 706 (FM, G, K, NY); Long Bay Cay, *Small & Carter* 8572 (BM, FM, G, NY, K, US); Nicholl's Town, *Small & Carter* 8938 (NY); *Brace* 5075 (FM, NY), 5276 (FM, NY), 5235 (FM, NY).



**Acklin's Island:** *Brace* 4373 (FM, NY). **Caicos:** North Caicos, *C. F. & C. M. Millspaugh* 9137 (FM, NY, US), *Proctor* 9086 (A). **Eleuthera:** Harbour Island, *E. G. Britton* 6376 (FM, NY, US); *Brace* 5429 (FM, NY), 5614 (FM, NY). **Great Exuma:** *Britton & Millspaugh* 2955 (FM, NY). **Inagua:** *Nash & Taylor* 1280 (BM, FM, NY), 1352 (FM, NY — type of *C. bahamensis*). **New Providence:** *Britton & Brace* 647 (FM, G, K, NY, US); *Eggers* 4486 (K, NY). **Watling's Island:** *Wilson* 7244 (FM, K, NY), 7355 (FM, G, K, NY).

***Coccoloba northropiae*** Britton, Bahama Flora 117. 1920 (as *Coccolobis*), Howard, Jour. Arnold Arb. 30: 411. 1949.

*Coccoloba leoganensis* var. *parvifolia* Griseb. Cat. Pl. Cub. 61. 1866.

*Coccoloba retusa* Lindau, Engl. Bot. Jahrb. 13: 150. 1890, in part; Northrop, Mem. Torrey Bot. Club 12: 34. 1902. Not Griseb.

Shrub or small tree to 4 m. tall; branches terete, pilose becoming glabrate, nodes slightly tumid; ochreae membranaceous, 2–3 mm. long, glabrous; leaf blades orbicular to obovate or elliptic, the apex rounded, obtuse or emarginate, the base narrowed,  $3 \times 2.5$ ,  $4 \times 3$  cm. long and wide, thinly coriaceous, glabrous, turning black on drying, commonly shiny above, dull beneath, the midrib and primary veins equally prominent on both surfaces, the secondary venation reticulate, primary veins 4–6 pairs, straight, diffuse branching and becoming reticulate near the margin, not arcuate and anastomosing, margin entire, flat; petioles 3–5 mm. long, short pilose pubescent; leaves of adventitious shoots variable in shape,  $5 \times 3$ ,  $6 \times 4$  cm. long and wide, on petioles to 7 mm. long; inflorescence terminal 5–7 cm. long, the rachis puberulent, the female more so than the male, the bracts ovate, less than 0.5 mm. long, the ochreolae membranaceous, less than 0.5 mm. long; male flowers in clusters of 2, the female flowers solitary, the flowering pedicels 0.5–1 mm. long, the hypanthium 1 mm. long, the perianth lobes 1 mm. long and wide, the fertile stamens less than 1 mm. long, the stamens of pistillate flowers rudimentary, less than 0.5 mm. long; fruiting pedicels 1.5 mm. long, the fruit ovoid, to 5 mm. long, 3 mm. thick, the perianth lobes appressed against the apex of the achene.

DISTRIBUTION: Cuba, Bahamas.

**Andros:** *J. I. & A. R. Northrop* 662 (NY), 705 (A, GH, NY), Mangrove cay near Lisbon Creek, *Small & Carter* 8483 (F, GH, NY, US). **Eleuthera:** Gregory Town, *Coker* 358 (NY). **Great Exuma:** *Britton & Millspaugh* 2982 (F, NY, US). **New Providence:** Nassau, *Curtis s.n.* (NY — holotype).

***Coccoloba swartzii*** Meisner, D.C. Prodr. 14: 159. 1856.

*Coccolobis diversifolia* Britton & Millspaugh, The Bahama Flora, 117. 1920; Northrop, Mem. Torrey Bot. Club 12: 34. 1902.

**Abaco:** *Brace* 1481 (FM, NY), 1697 (NY). **Bimini:** South Bimini, *R. A. & E. S. Howard* 10164 (G). **Caicos:** North Caicos, *Wilson* 7708 (FM, G, NY), 7744 (G, FM, NY); *Proctor* 9060 (A). **Crooked Island:** *Brace* 4658 (FM, MO, NY, US). **Fortune Island:** *Rothrock* 264 (FM, G, NY). **Great Bahama:** *Britton & Millspaugh* 2544 (FM, NY), 2396 (FM, NY). **Inagua:** *Nash & Taylor* 909



(FM, NY), 1009 (NY), 1014 (FM, NY), 1428 (NY). **Little Inagua:** *Wilson* 7769 (FM, G, NY). **Long Island:** *Britton & Millspaugh* 6316 (FM, NY); *Coker* 520 (NY). **New Providence:** *Britton & Brace* 231 (FM, NY), 324 (FM, G, MO, NY, US); *Britton & Millspaugh* 2175 (FM, NY); *Degener* 18970 (A); *Hitchcock s.n.* (MO); *J. I. & A. R. Northrop* 143 (FM, G, NY). **Rose Island:** *Britton & Millspaugh* 2122 (FM, NY, US); *Wilson* 7900 (FM, G, NY).

A complete description of this species and the synonymy was given earlier in this paper. The variations of *C. swartzii* throughout its range was discussed in the second paper of this series (Jour. Arnold Arb. 30: 420. 1949).

***Coccoloba krugii* Lindau, Engl. Bot. Jahrb. 13: 145. 1890.**

*Coccolobis krugii* Britton & Millspaugh, The Bahama Flora 118. 1920.

**Acklin's Island:** *Brace* 4387 (FM, NY, US), 4495 (FM, NY); *Eggers* 3960 (B, US). **Cat Island:** The Bight, *Britton & Millspaugh* 5917 (FM, NY); Fort Hine, *Britton & Millspaugh* 5948 (FM, NY); Orange Creek, *Britton & Millspaugh* 5779 (FM, NY); Port Howe, *Hitchcock s.n.* (MO). **Caicos:** Dellis' Cay, *C. F. & C. M. Millspaugh* 9225 (FM, G, NY); South Caicos, *Wilson* 7594 (FM, G, NY); West Caicos, *Wilson* 7754 (FM, G, NY); North Caicos, *Proctor* 8845 (A), 9180 (A). **Crooked Island:** *Brace* 4748 (FM, NY); *Hitchcock s.n.* (FM, MO). **Fortune Island:** *Eggers* 3998 (US), 3801 (US); *Rothrock* 261 (FM, G, NY). **Inagua:** *Nash & Taylor* 968 (FM, NY), 1059 (FM, NY); *Hitchcock s.n.* (MO). **Long Cay:** *Brace* 4040 (FM, NY, US). **New Providence:** *Curtis* 71 (A, G, FM, NY, MO, US); *Britton & Brace* 361 (FM, NY), 363 (FM, NY, US), 864 (FM, NY), 372 (FM, NY), 375 (FM, NY). **Watling's Island:** *Britton & Millspaugh* 6194 (FM, NY); *Coker* 473 (NY); *Wilson* 7215 (FM, G, MO, NY), 7324 (FM, G, MO, NY).

A complete description of this species was given earlier in this paper.